

## Certified Fire Alarm Design (CFAD) Certification Exam Study Guide

**The CFAD Exam is an open book, 85 question exam with a 3 hour time limit.**

Students will be allowed the option of using **ONLY THREE** of the following code books during the CFAD exam:

- International Building Code (IBC)
- NFPA 101® Life Safety Code®
- NFPA 70® National Electrical Code®
- NFPA 72® National Fire Alarm and Signaling Code®

There can be notes written in the books they just cannot be on paper (such as scrap paper) that can be removed from the books.

Permanent tabs are acceptable (ones that will rip the paper if they are taken off) but post it/sticky notes (ones that can be easily removed) will not be accepted during the exam.

### Competencies:

Codes and Standards	15%
Power	5%
Testing/Inspection	5%
Project Management	5%
System Types and Features	10%
Protection Criteria, Goals and Programming	10%
Emergency Control Functions	10%
Initiating Devices and Hazards	10%
Notification Appliances	10%
Submittal Package and Documentation	10%
Supervisory Components	10%

**CFAD Learning Objectives**

<b>Course</b>	<b>Outline</b>	<b>Learning Objective</b>	
Certified Fire Alarm (CAT) Level I	<b>Standards</b>	Describe how standards coordinate team activity and establish or indicate requirements.	
		Define the difference between standards and codes.	
		Explain how compliance to standards reduces liability and can result in fewer false alarms.	
			Define the term AHJ and explain the functions or occupations that may serve as an AHJ.
		<b>Power</b>	Describe what features and environmental factors to consider when choosing a power supply for an alarm system.
			Explain the purpose of a transformer and the difference between a step up transformer and a step down transformer.
			Understand how to calculate the maximum normal load and alarm load for secondary power.
			Understand how to calculate the battery amp hours needed for different categories of alarm systems.
			Explain the two categories of power and what supplies the power.
			The two ways of connecting batteries to an alarm system and the characteristics of each.
Fire Alarm Installation Methods (FAIM)	<b>Fire Alarm System Introduction</b>	Describe the history of fire alarms.	
		Explain the importance of Codes and Standards.	
		Cite examples of how fire alarm system installation mistakes can be made, and the role of this course in helping to prevent those errors.	
			Name the three questions that comprise Olin's Law.
		<b>Fire Alarm System Fundamentals</b>	Identify how many hours of standby and alarm power must be provided for supervising station fire systems providing occupant notification.
			Explain what comprises a power discharge cycle, as well as primary and secondary power requirements.
			List three occasions where fire alarm circuits do NOT have to be monitored for integrity.
			Describe each of the three different types of fire signals (alarm, supervisory, trouble) and state how long each has before being indicated at the FACP.
		<b>Operation of Initiating Devices and IDC Circuits</b>	Identify characteristics of the four stages of fire and apply that knowledge in regard to automatic fire detector selection.

### CFAD Learning Objectives

Course	Outline	Learning Objective
		Explain how various types of smoke detectors operate and identify their proper applications.
		Explain how various types of heat detectors operate and identify their proper applications.
		Differentiate between various types of manual initiating devices.
	<b>Initiating Devices - Spacing and Location</b>	Identify the minimum and maximum distances smoke and heat detectors can be located from the ceiling on a wall.
		Identify location considerations for smoke and heat detectors.
		Determine basic spacing of smoke and heat detectors on sloped and level ceilings with joists or beams.
		Determine basic spacing of smoke and heat detectors on sloped and level smooth ceilings.
		List the most likely causes of smoke detector false alarms.
		Identify the maximum distances pull boxes are to be installed from the exit, and travel distance between boxes.
	<b>Emergency Control Functions</b>	Describe the functions provided by Phase I and Phase II elevator recall.
		Identify the proper mounting locations for door release smoke detectors.
		Define what type of signal should be activated by a duct smoke detector.
		Explain the differences between access-controlled egress locking and delayed egress locking, and provisions for both.
		List the provisions that have to be followed when installing relays to activate Emergency control functions.
	<b>Notification Appliances and Circuits</b>	Describe the ANSI temporal-three audible pattern.
		Differentiate between public and private mode notification.
		Identify proper placement of audible/visual notification appliances in public and private applications.
		Identify proper application of Emergency Voice Alarm Communication (EVAC) systems.
		Differentiate between the Classes of NAC circuits and describe conditions that could cause impairments on each.
		List two types of alternate occupant notification.

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	<b>Communication &amp; Reporting</b>	Identify the various methods used by commercial fire alarm systems to communicate with supervising stations.
		Differentiate between the terms central station, proprietary station, and remote supervising station fire alarm systems.
		Describe the differences between transmission methods used by DACTs, IP transmitters, VoIP, dedicated cellular and radio transmitters to send signals to the supervising station.
		Identify the seven steps of DACT transmissions.
		Describe general information regarding private radio and GSM cellular as wireless communication methods.
		Identify why the lack of backup power for VoIP can adversely affect signal transmission reliability.
	<b>Testing, Inspecting, and Maintenance</b>	Identify which codes require fire alarm systems to be tested and why testing has proven to be so important.
		List the categories of fire alarm devices that should be tested quarterly, semi-annually and annually.
		Identify the test and inspection records that NFPA 72 requires to be kept and for how long.
		Specify the differences between, and methods for, functional testing, visual inspections and acceptance testing of fire alarm systems.
	<b>Fire Alarm System Documentation</b>	Identify what diagrams, manuals, manufacturer information and drawings are normally included as part of a fire alarm system submittal package.
		Describe the differences between a line riser diagram and a point-to-point wiring diagram.
		Indicate what text and labeling is included on a fire system floor plan.
		Describe what an as-built drawing must include.
		Indicate when a Record of Completion must be prepared and what information must be indicated.
	<b>NEC Fire Alarm Wiring Methods</b>	Identify the specific NEC articles with which one must comply.
		Apply the requirements of NFPA 70 (National Electrical Code) as applicable in fire alarm systems.
		Install fire system cable alongside non-fire system cabling within the specification of the NEC.
		Install fire system cable in non-standard applications or extreme conditions consistent with NEC requirements.
	<b>Carbon Monoxide Detection</b>	Properly select carbon monoxide (CO) detection equipment.

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		Define the difference between CO alarms and CO detectors.
		Identify the required locations for CO detectors.
		Identify inappropriate locations to be avoided when installing a CO detector.
		List the notifications that should be made by operators when a CO alarm is received.
		List the methods available for occupant notification.
		Identify proper CO device test and inspection procedures.
	<b>Emerging Technologies</b>	Identify one difference between a VISD system using server based software and one where software is integral to the cameras.
		Distinguish directional sounders from audible notification appliances and identify characteristics of each of their protection levels.
		List at least three delivery methods that mass notification systems can use to notify occupants.
		Define the components of a fiber optic heat detector and apply the characteristics of the system to a fire system installation.
<b>International Building Code (IBC)</b>	<b>Overview</b>	Explain how information is presented and organized in ICC IBC [09']
		Define the fundamental concepts to understanding code provisions Explain the recommended method for handling code deviations and conflicts
		Describe the provisions found within each occupancy chapter; Detection, Alarm Detection and Communications
		Describe the 10 occupancy classifications and where to locate their definitions
		Locate and explain Multiple Occupancies
		Describe high-rise considerations
	<b>Fire Alarm Systems</b>	Identify General Requirements, Manual Activation, Automatic Initiation, Occupant Notification, Monitoring, Fire Safety Control Functions, Automatic Sprinkler Systems, provisions of section 9
<b>Life Safety Code (LSC)</b>	<b>Overview</b>	Explain how information is presented and organized in NFPA 101 LSC (09')
		Define the terms and concepts found within the core chapters of LSC, chapters 1 through 10
		Describe the provisions contained in sub-section 3.4 found within each occupancy chapter; Detection, Alarm and Communications
		Describe the 12 occupancy classifications and where to locate their definitions

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		Explain the recommended method for handling code deviations and conflicts
		Describe chapter 43, Building Rehabilitation
	<b>Fire Alarm Systems</b>	Identify general requirements, signal initiation, smoke alarms and occupant notification provisions of section 9.6
		Describe requirements common to section 9.7, Automatic Sprinklers and other Extinguishing Equipment
Professional Fire Alarm Design (PFAD)	<b>The Industry</b>	Develop an installation plan for a commercial fire alarm system based on specific building conditions, and project requirements.
		Plans should be developed by persons experienced in the proper design, application, installation, and testing of these systems. Develop an installation plan for a commercial fire alarm system based on specific building conditions, and project requirements.
	<b>Fire Alarm Installation Review</b>	Define Statutory Requirement.
		Identify basic occupancy types.
		Outline the principles of communication and reporting.
		Describe the types of FACP operation.
		Explain the different circuit classes and survivability levels.
		Identify the various Emergency control functions and interconnectivity requirements.
	<b>Overview of Project Management Concepts</b>	Outline and assess the scope of an integration project using a formal evaluation process.
		Establish and maintain a project schedule using relevant technical knowledge.
		Monitor and track the work of internal resources.
		Learn how to maintain communication with all stakeholders throughout an integration project.
	<b>Determine Protection Criteria</b>	Differentiate between Prescriptive and Performance-based design methods.
		Define the terms: Total, Partial, Selective and Supplemental coverage as they relate to Required and Non-required Fire Alarm systems.
		Provide examples of the three levels of detector coverage described in NFPA 72.
		Describe when Performance-based design methods should be considered.
	<b>Additional System Design Requirements</b>	Cite an example of a typical fire system design requirement from each of the following: Contract, Architect/Engineer, Insurance Company, Accreditation Agencies, Government Agency

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	<b>Owner's Protection Goals</b>	List an example of a typical fire alarm design goal a building owner may have in each of the following categories in regards to the design of his building's fire alarm system: Life Safety, Unique Circumstances for First Responders, Property Protection, Mission Continuity, Environmental Protection, Existing Structures
	<b>Other Hazards</b>	Identify categories of Other Hazards that may enlarge the scope of your fire alarm project: Unusual Occupants, Building, Fuel Load, and Fire Impact Characteristics.
		Identify specific examples within these four categories that will impact your fire alarm system design.
		Identify solutions to enhance life-safety should these unusual circumstances arise.
	<b>Choosing Initiating Devices</b>	Describe when best to use the various kinds of smoke detection – spot type, projected beam, duct, air sampling, smoke alarm.
		Describe when best to use the various kinds of heat detection– spot type, fixed temperature, rate-of-rise, rate compensation.
		Compare/contrast features of Combination, Multi criteria, and Multi-sensor devices.
		Cite when CO Detection is required, and areas needing protection.
	<b>Design Project – Mixed Occupancy</b>	Layout a code compliant fire alarm system for a Mixed Occupancy facility.
		Identify a building's Occupancy and whether public or private- mode notification would be required.
		List how many manual and automatic devices would be required by code, minimally.
	<b>Choosing Supervisory</b>	Identify and Prescribe when best to use the various types of supervisory devices.
		Identify the code parameters for detecting dangerous air pressure levels in sprinkler systems.
		Identify the code parameters for detecting dangerous air and water temperature levels.
		Describe what fire pump conditions should be monitored by the fire alarm system.
		Describe other types and benefits of Releasing and Guard systems that can be supervised by the fire alarm system.
	<b>Choosing Notification</b>	Delineate the differences between public and private mode notification.
		Identify the code requirements for both audible and visible public mode notification.

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		Identify the code requirements for both audible and visible private mode notification.
		Describe the operation of a typical Emergency Voice Alarm Communication (EVAC) system.
	<b>Fire System Programming</b>	Define these terms: Pre-Signal, Alarm Verification, and Positive Alarm Sequence.
		Describe how common emergency control functions are programmed into a fire alarm system.
		Identify the code requirements for system programming as they relate to customer documentation.
	<b>Submittal Package Preparation</b>	Itemize key components that must be included with a fire alarm system submittal package.
		List the essential Documents provided by the equipment manufacturer that are included in the submittal package.
		Define 'Sequence of Operation' and various ways this information can be provided.
		Delineate information regarding circuit wiring that must be included in the wiring diagrams.
		Differentiate between Record Drawings and Shop Drawings.
	<b>Other Important Documentation</b>	Cite the importance of providing the customer with an on-going Testing Agreement.
		Describe the differences between these two tables: Visual Inspection Frequency and Functional Test Frequency.
		Cite the importance of a properly prepared Record of Completion form and its legacy as to the fire system's current operations.
		Identify the key reasons why adequate training for the customer and proper paperwork are so important.
	<b>Plan Preparation Project</b>	Layout a code compliant fire alarm system for a Residential facility.
		Identify a building's Occupancy and whether public or private- mode notification would be required.
		List how many manual and automatic devices would be required by code, minimally.
		Describe what emergency control functions need to be tied into the fire alarm system.
<b>Residential Fire Alarm (RFA)</b>	<b>Overview</b>	Define the common components of a Residential Fire System and the basic differences between a commercial and residential fire system.
		Describe requirements for proper installation of a control panel.

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		Explain basic residential fire system power terms, like primary and secondary power, and transformers.
		Define primary power circuitry guidelines for proper installation.
		Describe the proper locations and mounting of smoke, heat and CO detectors in a one- and two- family home according to code requirements.
		Explain installation of Notification Appliances; mounting Locations in sleeping and non sleeping rooms.
		Describe the differences between transmission methods used by DACTs, IP transmitters, VoIP, dedicated cellular and radio transmitters to send signals to the monitoring station.
		Describe the requirements for monitoring integrity of fire alarm circuits.
		Explain the NFPA code requirements for testing methods, and frequencies.
	<b>Codes and Standards</b>	Explain the basics of the International Building Code, the International Residential Code, and the Life Safety Code including which to follow, applicable sections and their specific purpose as it applies to residential fire alarm systems.
	<b>Control Panels</b>	Control Panels and Annunciators
		Interfacing with Optional Devices
		Programming the System
	<b>Power Requirements</b>	Power Supply/Standby Power
	<b>Initiating Devices</b>	Smoke Detectors
		Heat Detectors
		Installation of Smoke Alarms
		Installation of Smoke Detectors
		Installation of Heat Detectors (Wiring and Proper Locations)
		Installation of Smoke Alarms
	<b>Notification Appliances</b>	Notification Appliances
		Installation of Notification Appliances
	<b>Communication Methods</b>	Communicators and Remote Stations
		Optional Devices
		Other Non-Safety Devices/Functions
		Installation of Communicators and Remote Stations
	<b>Wiring and Circuitry</b>	Explain general wiring requirements as defined by NFPA 70 and NFPA 72, including: fire wire ratings and cable markings, splicing, t-tapping.
	<b>Testing and Service</b>	Frequency Schedules for Testing various Devices-NFPA 72
		Functional Testing to determine compliance with:

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		Test Method Table in NFPA 72 – How To Test:
	<b>Documentation</b>	Owner must be supplied with documentation
		Provide written notice to owner of defects during a test and get written acknowledgement
		Offer owner Contract for Regular Testing-Required every 3 years
	<b>Client Relations</b>	Describe rules for customer service and how to relieve the customer’s common anxieties and concerns.
		Explain the 3 stages of where there exists opportunities to build a relationship with your customer in both a residential and commercial application.
		Describe tactics that you can use when dealing with difficult customers.
		Explain the difference between contractual terms like maintenance, service and inspection.