



#### The Basics of NFPA 92, Standard for Smoke Control Systems, and Changes to Anticipate in 2018

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## **COURSE DESCRIPTION**

NFPA 92 applies to the design, installation, acceptance testing, operation, and ongoing periodic testing of smoke control systems. As the industry standard, it is important for designers, installers, and code enforcers to be familiar with the document, its history, and remain abreast of upcoming changes.



## LEARNING OBJECTIVES

At the end of the this course, participants will be able to:

1. Interpret the background and recent history of NFPA 92 and smoke control systems.

2. Comprehend smoke control design objectives, design approaches, and design criteria.

3. Determine testing procedures and required documentation for smoke control commissioning.

4. Understand how proposed changes to the 2018 edition can affect new designs and installations.



## WHAT ARE SMOKE CONTROL SYSTEMS?

"Engineered system that includes all methods that can be used singly or in combination to modify smoke movement."





## SMOKE CONTROL SYSTEMS







## SMOKE CONTROL SYSTEMS

#### Containment

A smoke control method that uses mechanical equipment to produce pressure differences across smoke barriers.



#### Management

A smoke control method that utilizes natural or mechanical systems to maintain a tenable environment in the means of egress from a large-volume space or to control and reduce the migration of smoke between the fire area and communicating spaces.



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SEDUA

## WHAT IS TENABILITY?

Tenable Environment: an environment in which smoke and heat are limited or otherwise restricted to maintain the impact on occupants to a level that is not life



This Photo by NPS



#### NFPA 92

- Standard for Smoke Control Systems
- Codes vs. Standards





## **RECENT HISTORY**

- NFPA 92A, Smoke Control Using Barriers and Pressure Differences
- NFPA 92B, Smoke Management Systems in Malls, Atria, and Large Areas
- Now combined into NFPA 92 as of 2012



# WHERE TO SEE SMOKE CONTROL

# Buildings with the following physical attributes/features:

- Atria
- Malls
- Arenas
- Concert/club venues
- Indoor theme parks
- High rises

#### **Verticals:**

- Detention/correctional
- Health care
- Educational (K-12 and higher ed.)
- Industrial
- Amusement
- Cultural



# HOW TO REALLY TELL

#### • IBC

- Chapter 4
- May be triggered by other sections
- Section 909 outlines requirements of systems

- NFPA 101
  - Chapters 12-43
  - Section 9.3 outlines requirements of systems





#### NFPA 92 BREAKDOWN

- Chapter 1: Administration
- Chapter 2: Referenced Publications
- Chapter 3: Definitions
- Chapter 4: Design Fundamentals



#### NFPA 92 BREAKDOWN

- Chapter 5: Smoke Control Calculation Procedures
  - ~1/3 of the standard
- Chapter 6: Building Equipment and Controls
- Chapter 7: Smoke Control System Documentation
- Chapter 8: Testing



#### NFPA 92 BREAKDOWN

#### • Appendices: There are 14



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#### **DESIGN CRITERIA**



#### **DESIGN PROCESS**



# DESIGN PROCESS: CALCULATION TOOLS



- "Hand" calculations
- Fire modeling software
  - FDS
  - Pyrosim
  - CONTAM
  - CFAST
- Evacuation modeling



## DESIGN PROCESS KEY TAKE AWAYS

- Custom parameters
- Experienced designer
- Documentation





# **BUILD THE THING**



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#### TESTING

# System must be tested in accordance with its own design criteria – DESIGN REPORT IS IMPORTANT





## TESTING

- Physical inspection
- Component tests
- Acceptance testing
  - Testing under four modes
  - Door opening force measurements
  - Controls activation
  - Operation of components
  - In accordance with its own design parameters





# TESTING – LARGE VOLUME SPACES



- Identify all areas to be measured
- Verify:
  - Operation of components
  - Measure exhaust capacities and air velocities
  - Measure door opening forces
- Where applicable, measure pressure differentials



### TESTING – SMOKE CONTAINMENT SYSTEMS

- Pressure testing
- Force testing
- Various types of pressurized systems:
  - Stairwell
  - Elevator shaft
  - Lobby
  - Vestibule
  - Zones
  - Area of refuge





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### TESTING – CLOSE OUT

- Test firefighter control panel
- Provide testing
  documentation
  - Address design criteria
- Schedule periodic testing





## CHANGES TO 2018 - UUKL

- Weekly self-test functionality of the smoke control panel
- New addition allows for bypass of actual activation upon AHJ approval
- Testing plan required; no less than semi-annually
- Affects to commissioning process:
  - Must be UUKL listed
  - OR have AHJ approval and test plan



## CHANGES TO 2018 - TENABILITY

- Added in Appendix M
- Tool to aid in the design
- Affects commissioning: sets parameters for measurement during acceptance testing
- Should make it more uniform across different jurisdictions





#### REMINDER





#### This concludes The American Institute of Architects Continuing Education Systems Course

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