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How UFC 3-600-1 Changes Your Fire Protection Design
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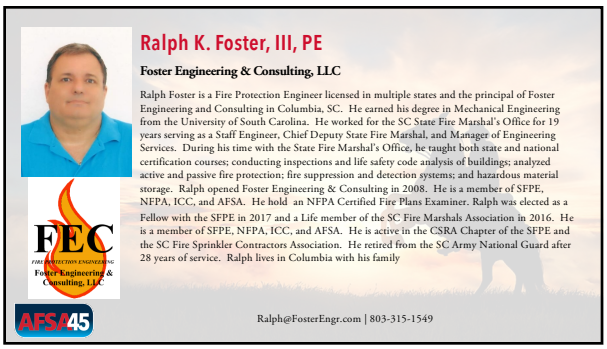
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Ralph Foster is a Fire Protection Engineer licensed in multiple states and the principal of Foster Engineering and Consulting in Columbia, SC. He earned his degree in Mechanical Engineering from the University of South Carolina. He worked for the SC State Fire Marshal's Office for 19 years serving as a Staff Engineer, Chief Deputy State Fire Marshal, and Manager of Engineering Services. During his time with the State Fire Marshal's Office, he taught both state and national certification courses; conducting inspections and life safety code analysis of buildings; analyzed active and passive fire protection; fire suppression and detection systems; and hazardous material storage. Ralph opened Foster Engineering & Consulting in 2008. He is a member of SFPE, NFPA, ICC, and AFSA. He hold an NFPA Certified Fire Plans Examiner. Ralph was elected as a Fellow with the SFPE in 2017 and a Life member of the SC Fire Marshals Association in 2016. He is a member of SFPE, NFPA, ICC, and AFSA. He is active in the CSRA Chapter of the SFPE and the SC Fire Sprinkler Contractors Association. He retired from the SC Army National Guard after 28 years of service. Ralph lives in Columbia with his family
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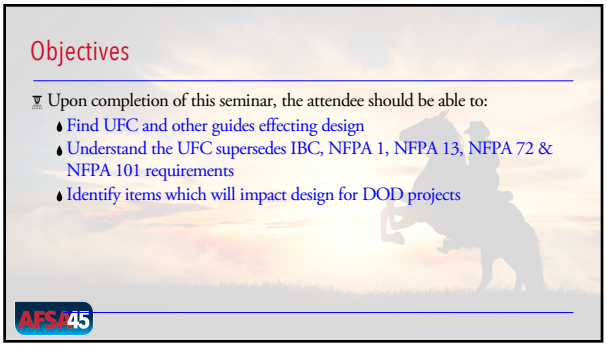
Objectives
Upon completion of this seminar, the attendee should be able to:
Find UFC and other guides effecting design
Understand the UFC supersedes IBC, NFPA 1, NFPA 13, NFPA 72 & NFPA 101 requirements
Identify items which will impact design for DOD projects
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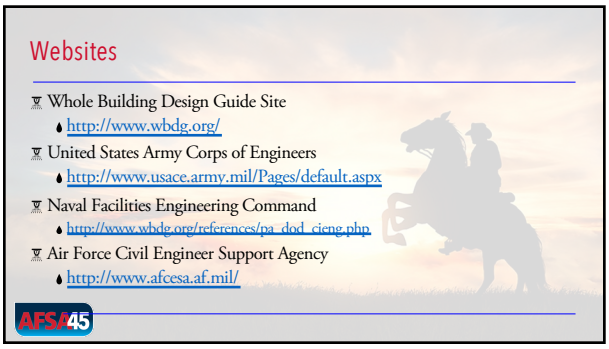
Websites
Whole Building Design Guide Site
http://www.wbdg.org/
United States Army Corps of Engineers
http://www.usace.army.mil/Pages/default.aspx
Naval Facilities Engineering Command
http://www.wbdg.org/references/pa_dod_cieng.php
Air Force Civil Engineer Support Agency
http://www.afcesa.af.mil/
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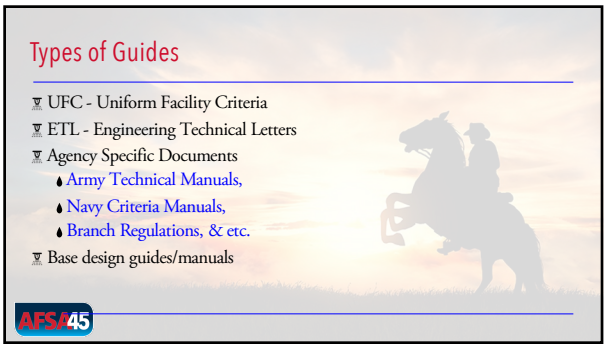
Types of Guides
UFC - Uniform Facility Criteria
ETL - Engineering Technical Letters
Agency Specific Documents
Army Technical Manuals,
Navy Criteria Manuals,
Branch Regulations, & etc.
Base design guides/manuals
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UFCs of Interest

- UFC 1-200-01 DoD Building Code
  - 27-Jul 26 (Adopts 2024 IBC)
- UFC 3-600-01 – Fire Protection Engineering
  - 4 May 2026 (New Edition!)
- UFC 4-010-01 – Mass Notification
  - Change 1 Dated 22-Jan-2010
- Series 4: Multi-Disciplinary and Specific Design
  - Occupancy based standards series (100- 800)
  - Series 4 trump Series 3 manuals

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UFC 3-600-01

- Scope:
  - Comply with requirements of Chapter 1 of UFC 1-200-01
  - This UFC chapter structure is aligned with the chapters of the IBC
- 2-1.1 International Fire Code
  - Replace IFC references in IBC with NFPA 1, *Fire Code*
  - *Except* where this UFC explicitly directs otherwise

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UFC 3-600-01

- **2-1.2 Industry Standards, Codes and Guides**
  - This UFC supersedes NFPA and industry standards except where specifically cited
  - For criteria not in this UFC, conform to the latest National Fire Codes edition
  - Submit fire protection design analysis to the DFPE for approval when National Fire Codes lack criteria
  - Do not use state and local codes unless specifically referenced in this UFC

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Definitions

- 2-2 Qualified Fire Protection Engineer (QFPE)
  - A registered fire protection engineer that has passed the fire protection engineering examination from NCEES
  - OR approved by the DFPE
- 2-3 FIRE PROTECTION QUALITY CONTROL SPECIALIST (FPQC)
  - Must have the same qualifications of the QFPE
  - Must have five years experience overseeing "Construction Administration"
- NICET requirements are found in the project specifications

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Definitions

- DFPE – Designated Fire Protection Engineer
  - Maybe assigned to the base or reginal office
  - The DoD Fire Protection Engineer overseeing an area of responsibility for a project
  - Sometimes referred to as the "cognizant" Fire Protection Engineer.
- CFPE – Component Fire Protection Engineer
  - Designated (or Service) Fire Protection Engineer (DFPE)

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Components – CFPE's "Home"

- Army – HQ USACE/CECW-EC
- Navy & Marine Corps – NAVFAC, Fire Protection Engineering Technical Warrant Holder
- U.S. Air Force – Air Force Civil Engineer Center/Operations Directorate (AFCEC/CO)
- Defense Logistic Agency (DLA)
- NGA, NRO, WHS & NSA/CSS

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Equivalencies, Exemptions, Waivers, & PBFPD

- 2-6 Equivalencies
  - Approval of CFPE required
  - Lack of funds is not considered sufficient justification for an equivalency
  - Equivalencies apply only to the specific facility or project involved, and are not blanket approvals
- 2-7 Exemptions and Waivers
  - Submit exemptions to Service signature authority for determination
- 2-8 PERFORMANCE-BASED FIRE PROTECTION DESIGN
  - Use performance-based design requires CFPE approval

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Chapter 4 – 51 Special Occupancies

- 3D Printing
- Aircraft Facilities
- Ammo & Explosives
- Battery Storage (Li-Ion)
- Child Day Care
- Commissaries & Exchanges
- Detention & Correctional
- Elevators
- Food Preparation Facilities
- Hazardous Materials & Waste
- Historic Facilities
- Medical Facilities
- Oxygen
- Personnel Housing
- Power Generation Facilities
- Relocatable
- SCIF
- Trash & Recycling
- Vehicle Parking
- Warehouses

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para 4-13 – Electronic & Telecom Equipment Areas

- Electronic & Telecommunication Areas follow NFPA 75
- Must serve more than 1 building
- Over 2,500 SF, sprinklers
- Noncombustible construction
- Smoke detection must be Very Early Warning type
- Clean Agents Extinguishing System require DFPE Approval
- Wet sprinkler system (no preaction)
- Power disconnect required

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Chapter 5-8

- Building height and area per IBC Ch 5
- Occupancy separation per IBC
  - Medical per NFPA 101
- Construction Type per IBC Ch 6
- Exposure protection per IBC Ch 6
- Construction of fire rated assemblies per IBC 7
- High Volume Low Speed Fans per NFPA 13
- Interior finishes per NFPA 101

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Fire Flows & Service Mains

- 9-2 For facilities per NFPA 1
  - Calculate independently of fire water demand
- 9-3 Service laterals must not exceed 10ft/sec
  - Service mains or laterals serving fire pumps, velocities must be calculated using 150% of the rated capacity of the fire pump
- 9-3.3 New valves must open by counter-clockwise rotation of stem

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Fire Hydrants (para 9-3.4.2)

- Provide hydrants per NFPA 24 except as modified by this UFC
  - Install hydrants adjacent to paved areas accessible to fire department apparatus.
  - Install fire hydrants adjacent to airfield pavement not more than 24 in above the level of the adjacent airfield pavement.
  - Grade ground so any surface drainage is away from hydrant.
  - Locate landscaping, fencing, bollards and similar minimum of 24 in from hydrant vertical centerline and not directly in front of any outlet.

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Fire Hydrants (para 9-3.4.3)

- Facility exterior must be within 350 ft of a hydrant
- Locate minimum one hydrant within 150 ft of FDC
- Space hydrants protecting warehouses along facility sides with fire department access at 300-ft maximum intervals.
- Provide exterior storage and military/tactical equipment/vehicle parking with hydrants spaced at 300-ft along sides with all-weather fire department access
- For sprinklered family housing, space hydrants at 1,000 ft maximum intervals.
- For aircraft parking & servicing aprons, space hydrants at 300-ft along one side

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Fire Hydrants (9-3.4.4)

- Protect hydrants located adjacent to parking, vehicle traffic or other areas subject to mechanical damage by bollards
- Refer to UFC 3-260-01, regarding bollards required for hydrants located adjacent to aircraft parking and servicing aprons.
- Locate bollards so not directly in front of outlet
- Allow clearance to attach hoses, remove hydrant caps, and open and close the hydrant without obstruction

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Water Storage (para 9-4)

- On-site fire protection water storage must comply with NFPA 22 except where this UFC specifically modifies
- Supply Stored must be 120% of facility maximum water demand
  - Includes domestic and industrial demands
  - Permitted to consider refill rate for the tank
- Refill rate
  - Self-replenishable to required volume within 48 hours during normal domestic and industrial consumption of the supplying utility
  - The DFPE may approve longer fill times

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Monitoring (para 9-4.3)

- Remote monitoring of tank water level by building fire alarm
- Monitor tank water temperature by installation fire alarm reporting system in areas subject to freezing

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Fire Pumps (para 9-5)

- Provide access to remove pump
  - Double doors or roll up
- Provide 3 ft clearance on one side of pump
  - clearance cannot be opening the doors
- Commentary recommended size 12 ft x 20 ft
- Label piping (suction, discharge, to FDC, bypass, etc.)
  - White, 2" high letters, and visible from 3 side when viewed from the floor
- Fire pump is limited to 140%
  - DFPE may approve less but above system demand

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Fire Pump (Para9-5.5)

- Terminate all piping to exterior to prevent damage
  - DFPE may approve floor drain
- Provide concrete pad, splash block, paved surface to prevent erosion
  - Splash block may not become discharged during testing
- Exterior discharge may not interfere with egress paths
- Full flow relief must discharge safely per NFPA 20
  - If a tank – must discharge to tank

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Fire Pumps (para 9-5.7 - .9)

- Pump must shut down after reaching stop pressure and minimum run time
  - Stop pressure must be 5 psi below max churn pressure at lowest static pressure
  - Commentary say this is to allow for gauge error
- Where reliable electric power is available, use electric motor-driven pumps
  - DFPE may require secondary power source if electric is deemed unreliable
- Provide a soft start controller for pumps greater than or equal to 100 hp when connected to an emergency generator
  - Any method is ok if not emergency generator

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Fire Suppression (para 9-6)

- Connect suppression system to the fire alarm
  - Transmit alarm, supervisory, and trouble signals
  - NFPA 13D are exempt

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Working (Shop) Drawings (para 9-6.2.1 & .2)

- 9-6.21 Plans and Calculations
  - Shop drawings & calculations prepared by
    - NICET - Automatic Sprinkler Systems - Level III
    - NICET - Special Hazards Suppression Systems - Level IV certification
- Show dimensions from standpipe and riser edges to nearest adjacent wall when located in a stair or egress paths.
- A FPQC review shop drawings, hydraulic calculation, and material submittal before submitting to DFPE

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Fire Suppression (para 9-6.2.3 - .4)

- Calculations must comply with NFPA standard to show adequate supply
- Must include 12 psi for BFP and 8 psi for double check BFP
- Waterflow Test must be under the direction of the QFPE
  - Testing must comply with NFPA 291

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Backflow Preventor (9-6.3.1)

- Hydraulic calculations required for installing BFP on existing systems
- Follow installation requirements for the proper type of BFP
- RZP required for antifreeze, foam, or other chemical are added to the system
- Provide low temperature alarm connected to facility's FACU for heated enclosures
- Heat trace is not permitted unless an enclosure is not possible
- Bottom of horizontal BFP no greater than 24" AFF
- Vertical BFP must have hand wheel 6 Ft or less AFF

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Automatic Sprinkler System (9-7)

- Must comply with NFPA 13 except as modified by UFC
- Sprinkler building when required by other codes or standards
- Provide sprinkler for these buildings:
  - Type I or II with gross floor area over 15,000 ft²
  - Multi-story Facilities with total floor area over 5,000 ft², any construction type
  - Type III or IV or V with gross floor area over 5,000 ft², single story

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New or Modified Systems in Existing Facilities

- Existing facilities must comply with UFC 3-600-01 Chapter 34
  - Family Housing damaged above 50% of replacement cost
    - para 34-5.1.2 requires sprinkler protection through out facility per NFPA 13, 13R or 13D
- Added sprinkler systems must be designed for the current project area and to support future sprinklers for the remaining facility
- UFC 3-600-01 does not have Group 2 for Ordinary or Extra Hazard
- Desing must comply with Table 9-1 and 9-2

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Table 9-1

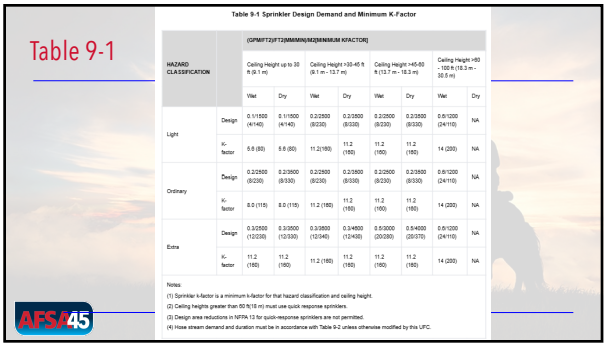

Table 9-1 Sprinkler Design Demand and Minimum K-Factor

HAZARD CLASSIFICATION		(GPM/FT2)/(FT2/MIN/MIN)/(M2/MIN/MIN)/MINIMUM K-FACTOR]							
		Ceiling Height up to 30 ft (9.1 m)		Ceiling Height >30-45 ft (9.1 m - 13.7 m)		Ceiling Height >45-60 ft (13.7 m - 18.3 m)		Ceiling Height >60 - 100 ft (18.3 m - 30.5 m)	
		Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Light	Design	0.1/1500 (4/140)	0.1/1500 (4/140)	0.2/2500 (8/230)	0.2/2500 (8/330)	0.2/2500 (8/230)	0.2/2500 (8/330)	0.5/1200 (24/110)	NA
	K-factor	5.6 (80)	5.6 (80)	11.2(160)	11.2 (160)	11.2 (160)	11.2 (160)	14 (200)	NA
Ordinary	Design	0.2/2500 (8/230)	0.2/2500 (8/330)	0.2/2500 (8/230)	0.2/2500 (8/330)	0.2/2500 (8/230)	0.2/2500 (8/330)	0.5/1200 (24/110)	NA
	K-factor	8.0 (115)	8.0 (115)	11.2 (160)	11.2 (160)	11.2 (160)	11.2 (160)	14 (200)	NA
Extra	Design	0.3/2500 (12/230)	0.3/2500 (12/330)	0.3/2500 (12/340)	0.3/4650 (12/430)	0.5/3000 (20/280)	0.5/4000 (20/370)	0.5/1200 (24/110)	NA
	K-factor	11.2 (160)	11.2 (160)	11.2 (160)	11.2 (160)	11.2 (160)	11.2 (160)	14 (200)	NA

Notes:
(1) Sprinkler k-factor is a minimum k-factor for that hazard classification and ceiling height.
(2) Ceiling heights greater than 50 ft (16 m) must use quick response sprinklers.
(3) Design area reductions in NFPA 13 for quick-response sprinklers are not permitted.
(4) Hose stream demand and duration must be in accordance with Table 9-2 unless otherwise modified by this UFC.

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Table 9-2

Table 9-2 Hose Stream Demand and Duration

HAZARD CLASSIFICATION	HOSE DEMAND, GPM (LPM)		DURATION, MIN
	Ceilings 60 ft (18.3 m) or less	Ceilings greater than 60 ft (18.3 m)	
Light	250 (950)	500 (1900)	60
Ordinary	250 (950)	500 (1900)	60
Extra	500 (1900)	500 (1900)	90

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Sprinkler Coverage (para 9-7.5)

- Sprinklers may be omitted where permitted by applicable NFPA codes.
- Sprinklers must be provided in electrical rooms, regardless of the fire resistance rated separation.
- Listed or approved residential sprinklers are permitted to be used at their listed/approved spacing and coverage.
- Extended coverage sprinklers are not permitted, except for loading docks, and protection of historic structures and unique spaces, with DFPE approval.

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Hydraulic Calculations (para 9-7.6)

- Sprinkler systems must be designed using hydraulic calculations.
- Pipe schedule method can only be used for addition of no more than 20 sprinklers to existing systems, or systems supplied from domestic plumbing
- The most hydraulically demanding single riser must be used in calculations, with no simultaneous risers

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Piping (para 9-7.7)

- Galvanized piping is permitted only for deluge sprinkler systems, valve trim piping, and drain piping exposed to the facility exterior
- Black steel pipe must be used for addition, repair, or relocation of existing galvanized pipe in wet pipe, dry pipe, or preaction systems
- CPVC is permitted only for family housing for residential occupancies
  - Air Force permits CPVC and other listed plastic sprinkler pipe uses in any occupancy allowed by the listing when strictly installed per the listing
- Piping 2" in diameter must be minimum Schedule 40
- Piping greater than 2 in must be minimum Schedule 10

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Piping (para 9-7.7)

- Steel piping with wall thickness less than Schedule 40 must not be threaded
- Changes in pipe sizes must be made through tapered reducing pipe fittings
- Threaded fittings must use PTFE (Polytetrafluoroethylene) tape or manufacturer's approved joint compound
- Fittings, mechanical couplings, and rubber gaskets must be from the same manufacturer
- Plain end fittings with mechanical couplings and fittings that use steel gripping devices to bite into the pipe are prohibited
- Saddle tees using rubber gasket fittings are permitted only when connecting to existing piping for additions or modifications
  - Saddle tees must use a connection method that completely wraps around the pipe.
- Use of flexible sprinkler hoses with fittings intended for direct connection to sprinklers must be approved by the DFPE.
  - See TSFPEWG-G 3600019-7.6, for additional guidance regarding flexible sprinkler hose fittings.

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Dry Pipe Systems (para 9-7.8)

- For Dry Pipe Systems, provide the following:
  - Rubber gasket grooved-end pipe fittings for dry pipe systems must be listed or approved for dry pipe systems.
  - Provide a minimum clearance of 3 ft access to and in front of all equipment and 6 ins behind the equipment.
  - Thrust rod all pipe penetrations through the grade floor slab, unless flanged or welded joints are used throughout the below slab piping
    - Pipe penetrations through the grade floor slab must be sleeved and sealed
    - See UFC 3-301-01, Structural Engineering, for more information

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Drain & Test Connections (para 9-7.8.1)

- Pipe drain/test connection for each waterflow switch, including the elevator power shunt outside
- Discharge must not interfere with personnel exiting and water must not cross an exit or exit discharge path
- Do not discharge to the roof
- Comply with local environmental requirements for the handling of sprinkler discharge water
- Provide splash blocks at all drain and inspector's test connection not discharging to a concrete surface
- Splash blocks must be large enough to prevent erosion & must not dislodge during flow of the main drain
- Ensure all discharged water drains away from the facility and does not cause property damage
- Interior termination points can be approved by the DFPE when exterior termination is not practical
- Drains, test connection pipe, and similar piping must not penetrate an exterior wall at any point higher than 2 ft above finished grade, and at no time below grade

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Drain & Test Connections (para 9-7.8.1)

- Pipe all drain/test connection to a location that accepts full flow and does not cause property damage when water is discharging
- Provide Individual floor control assemblies for each floor when there are three or more floor levels
  - Mezzanines are not considered a floor level for this requirement
- Provide a dedicated control valve assembly for piping serving rooms that require shunt-tripping of equipment power prior to the application of water
  - Locate the control valve assembly outside of the area it serves in an easily accessible identified location
- Supervise normally open valves required by NFPA electrically
- Lock or seal normally closed valves requiring supervision by NFPA, unless otherwise required by this UFC
- Provide listed or approved sprinkler guards for sprinklers that are less than 7 ft AFF (in unfinished areas)

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para 9-7.9 to 9-7.10

- Seismic design shall comply with the IBC and ASCE 7
- Seismic protection is not required for seismic design category A & B
  - Except 4-5.4.2 Seismic Protection (Ammunition & Explosive Facilities)
    - Automatic sprinkler and water spray system piping must be protected from movement per NFPA 13, regardless of seismic design category
    - Design the system using a minimum seismic coefficient (Cp) of 0.5.
- Family Housing
  - Sprinkler system installed in locations having a 99.6% dry bulb temperature less than 32°F may not have piping in the attic or exterior walls

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Water Spray Systems

- Water spray systems must comply with NFPA 15 and this UFC's fire suppression requirements.

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Foam Systems (para 9-9)

- Installation of new AFFF systems are prohibited.
- Foam System must comply with NFPA 11, NFPA 16, and this UFC
  - Except as specified on para 9-9.1 and 9-9.2
- New systems must use potable water
  - Use of saltwater, brackish, or untreated water requires CFPE approval
- Label foam storage tanks with permanent signs indicating:
  - Vendor, Model, Type, and quantity of foam
- Consult local environmental regulations for control, treatment, and remediation measure for the fire suppression discharge

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Foam Systems (para 9-9.1 & .2)

- Low Expansion Foam System Foam
  - Systems using Fluorine Free Foam (F3) must only use F3 concentrate listed for application
  - Collect and contain discharged F3 solutions.
- High Expansion Foam Systems Use of
  - High expansion foam systems are permitted only when authorized by the CFPE unless required by this or other UFCs

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Foam Piping

- Sch 40 piping for all foam solution piping
- Provide stainless steel foam concentrate pipe with roll grooved, welded, or flanged joints and fittings
  - Gasket material must be approved by the foam concentrate manufacturer
- Concealed concentrate piping must use welded or flanged fittings
- Provide brass trim piping on all deluge valves, flow control valves, and alarm check valves
- Locate foam concentrate lines above grade

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Foam Pumps, Tanks, Valves (9-9.4-.6)

- Provide foam concentrate pumps where distance from tank to proportioner exceeds 50 ft or
  - Or manufacturer recommended distance based on water supply less.
- Provide translucent or opaque, double-walled, polyethylene atmospheric tank
- For control of foam concentrate, use valves listed or approved for foam concentrate
- Isolation control valves must be full port ball type with an operating handle indicating on/off position of valve
  - Unit must be socket weld or flanged type
  - Valve body and ball must be 316 stainless steel complying with ASTM A351/A351M.
- Electrically supervise all foam system valves affecting foam delivery

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para 9-9.7 – 9-9.9

- Provide spill control around foam storage tank(s) to isolate tanks from drains
- Spill control must consist of a minimum 4 in high concrete berm sized for the full volume of the tank
  - Double-walled polyethylene tanks may provide spill control with no taps or outlets in sides or bottom of tank
- Surrogate test liquid may be used for initial acceptance and routine testing if liquid and test method is approved by a DoD component
- Foam solution discharge for maintenance and testing purpose must comply with local installation environmental requirements

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9-10 Standpipes

- Standpipes must comply with NFPA 14 and this UFC except as modified
- Provide a Class I standpipe in facilities 4 stories or more in height
- Provide a Class I standpipe for facilities less than 4 stories where all portions of the building cannot be reached from an exterior door in less than 450 ft
- Class II & III standpipes are not permitted

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Water Mist Systems (para 9-14)

- Water mist fire protection systems must be approved by DFPE in collaboration with the CFPE
- Water mist systems must and comply with NFPA 750 and this UFC's requirements.
- Water mist systems must not be substituted where automatic sprinkler systems are required
- Provide separate stand-alone control panels listed for releasing service and monitored by facility fire alarm system

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Fire Alarm Systems (para 9-17.1)

- Provided when required by NFPA 101
- Must Comply with NFPA 72 except as modified by this UFC
  - Install of fire alarm systems in accordance with the latest edition of the ABA/ABAAG
  - Fire alarm systems must be independent, standalone systems
  - Wireless interior fire alarm systems, devices, and appliances are not permitted.
  - Fire alarm systems may be connected to security systems or an EMCS for monitoring purposes only, but may not rely on those other systems for operation or reporting

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Fire Alarm System (para 9-17.2-.3)

- Plans and Calculations
  - Shop drawings & calculations prepared by
    - NICET – Fire Alarm System - Level III
    - Combined FA/MNS - Level IV (UFC 4-021-01 para 4-2)
- A FPQC must review shop drawings, calculations, and material submittals before submitting to the DFPE

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Fire Alarm Reporting System (para 9-17.4)

- Must comply with NFPA 72 and NFPA 70
- FACU must be connected to the FARS
- The following minimum signals must be transmitted
  - Alarm signal by device type (waterflow, manual pull station, sleeping room smoke detector)
  - Common supervisory signal
  - Common trouble signal
  - Signal indicating restoration to normal

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Control Panel (para 9-17.5)

- FACU must be addressable and site programmable
- FACU or remote annunciator must be at primary entrance
- Control must be password-protected and key-protected against unauthorized personnel

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Detection (para (9-17.6)

- Do not provide detection above-and-beyond what is code required.
- Examples of code-required detection for auxiliary systems include, but is not limited to:
  - Elevator recall.
  - HVAC shutdown.
  - Door hold-open devices in smoke or fire/smoke barriers.
  - Fire/smoke or smoke damper closure.
  - Activation of smoke control systems.

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Audio Visual Notification (para (9-17.7)

- Provide audible notification by speakers where a mass notification system (MNS) is required.
- Provide a minimum of one audible and one visual notification appliance circuit per floor.
- Each notification appliance circuit must include 25 percent spare capacity.
- Voice audible notification appliance spare capacity must be based on a starting value of planned speaker wattage settings.
- When a fire alarm system smoke detector with a sounder base is used in sleeping rooms, system audible notification appliances are still required in the room
- Performance requirements for audible notification must be met with all doors, fire shutters, movable partitions, and other similar devices closed
- Provide visible notification in any normally unoccupied area where ambient noise is loud enough to require hearing protection
- Visible notification is required in offices and other personal spaces assigned to a person who is deaf or hard of hearing (commentary includes toilets).

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In Building MMNS (9-17.7.1)

- Where required by another UFC (UFC 4-010-01) it must be implemented per NFPA 72
  - NFPA 72 MNS risk analysis is not required
- MNS may be omitted with DFPE's approval
- New & replacement MNS must be combined with fire alarm system
  - DFPE must approve other arrangements
- Install ACU at location specified by Service/Agency for a FACU
- LOC must be provided

57

Notification Appliances (para 9-17.7.1.1)

- Combination FA/MNS, provide clear strobe lights marked "ALERT" along with light-emitting diode (LED)-type text signs.
- MNS text signs are required over the door to each egress stairwell and over (or adjacent to) the substantial means of egress from the level of discharge
  - a) FA/MNS where strobes are activated only in a fire emergency, provide strobes marked with "FIRE" in accordance with NFPA 72
  - b) MNS text signs are not required for combined FA/MNS when the system strobes are activated only for a fire emergency
  - c) MNS strobes and text signs are not required for stand-alone MNS in buildings without a fire alarm system

58

Notification Appliances (para 9-17.7.1.1)

- Provide audible notification appliances per NFPA 72
  - The DFPE may authorize the use of non-fire rated audible notification appliances when needed to improve intelligibility
- The DFPE must determine the intelligibility of audible notification signals
- Several rules for low intelligibility are in the commentary
  - Acoustically hard surfaces & 33 ft travel to an intelligible speaker
  - 50 ft travel allowed for unoccupied spaces which are audible
  - Cavernous spaces are ok when audible

59

Sprinkler Systems (9-17.7.2)

- The building FACU must monitor building sprinkler systems per NFPA 13 and NFPA 72, with the following exceptions.
  - Report each sprinkler waterflow switch by its own separate address.
  - High and low air/nitrogen pressure on dry and preaction systems must report on a per riser basis as a supervisory function
  - No more than five valve supervisory switches, located within the same room, may be allowed to report as a single address

60

Manual Fire Alarm Boxes (para 9-17.7.3)

- Provide addressable, double-action type, manual pull stations at all building exits, regardless of occupancy
- If the manual pull station requires a key for reset, it must be the same key as required for the fire alarm control unit
- Conventional, single-action, manual pull stations are permitted in hazardous areas, wet and damp locations, and other areas where specialty listings are required
- Where conventional manual pull stations are used, each must be provided with a separate address

61

Smoke Detection (para 9-17.7.4)

- Provide smoke detectors connected to the building fire alarm system in all sleeping and duty rooms
  - Except inpatient sleeping rooms within a healthcare occupancy
  - See Chapter 4 for personnel housing
- Under-floor and/or above-ceiling smoke detectors, a drawing of an AutoCAD floor plan showing location of devices and their addresses, must be mounted outside of the space and adjacent to the main entrance.

62

Wiring, Circuits, and Conduit (para 9-17.8)

- All fire alarm and mass notification system wiring, cables, and circuits are to be provided per NFPA 70, NFPA 72, and manufacturer-specific requirements, with the following modifications
  - Fire alarm circuit pathways must be Class B, unless otherwise approved by the Service DFPE.
  - All conductors must be installed in conduit. Provide intermediate metal conduit (IMC), rigid metal conduit (RMC), and flexible metal conduit (FMC) where required per UFC 3-520-01
  - Conductors must be continuous from panel and/or terminal cabinet-to-device, or device-to-device - wire nuts, crimped connectors, or twisting of conductors is prohibited.
  - All devices must have screw terminals. Where devices are provided from the manufacturer only with pigtails, pigtails must be landed on terminal strips mounted in the device's junction box
  - All terminations must be at a terminal strip or the device screw terminals.
    - Terminal strips are permitted only where direct connection to a device is not possible
    - Premanufactured assemblies, tested by the manufacturer may be considered individual devices.

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Wiring, Circuits, and Conduit (para 9-17.8)

- Run wiring to and in the FACU and terminal cabinets in the vertical or horizontal plane
- All changes in wire direction must be made at 90-degree angles
- Tightly bundle, wrap, and identify all conductors individually with permanent markings
- Conductor markings must be printed labels, permanently affixed to the conductor via shrink wrap
- All SLC must use minimum 18 AWG
- IDC & NAC conductors must be minimum 16 AWG
- IDC used for optical flame detection devices must use shielded cable
- In unfinished areas, all conduit, junction/back boxes, covers, and couplings, must be red in color
- In finished areas, all exposed conduit, junction/back boxes, covers and couplings must be red or painted to match the room finish and the inside cover of the junction box labeled "Fire Alarm"

64

Power and Surge Suppression (para 9-17.9)

- Surge suppression is not required for devices connected directly to the facility exterior, when the facility is provided with lightning protection
  - An electric bell or speaker mounted on the exterior wall
- Provide surge protection on all 120 VAC circuits to control panels, subpanels, transmitters, amplifier panels, and booster panels
- Surge protection must have both a UL 1449 and UL 1283 listing and must be located in a hinged terminal box located next to the panel it is protecting
  - Remember some manufacturer require a 3-foot wire length between the TVSS and the FACU buried in their installation requirements

65

CO Detectors (para 9-18)

- Provide CO Detectors in facilities with fuel burning equipment
  - Detectors must be powered by FACU
  - 120 V is only allowed in facilities without FACU
- Detectors must comply with NFPA 101, NFPA 72 and manufacturer's requirements
  - Commentary prohibits combined Smoke & CO detectors

66

Smoke Control System (para 9-19)

- Provide per NFPA 92
- Desing must follow industry standards
  - SFPE Handbook of Smoke Control Engineering
  - DFPE may approve other documents like research
- Must have a written integration plan with other trades
  - Plan must include physical and logical interfaces
  - Must include testing plan
- Testing plan must be submitted and approved

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General Fire Alarm Items

- Know your base's central station and reporting system
  - Do the use Monaco, Kingfisher, other?
  - Do they communicate by radio signal or internet?
  - Does the base have the ability to send messages to the buildings?
  - Do they require scrolling textual or static signs
  - If Marine Corp base – ask if they have MNS or require textual signs

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4-16 Elevators

- Major Types of Elevators
  - Electric Traction Elevators
    - Sometimes referred to as Cabled or Electric
  - Hydraulic Elevators
    - Direct Plunger Hydraulic
    - Holeless Hydraulic
    - Roped Hydraulic
  - Belt Driven

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4-16 Elevators

- Provide sprinkler(s) with sprinkler guard(s) in the machine room(s)
- Provide a supervised shut-off valve, check valve, flow switch, & test valve in the line to the machine room(s)
- Locate outside and adjacent to the machine room(s)
- Must pipe drain outside or a drain with 40 gpm capacity
- The flow switch must have no time delay capability
- Actuation of the flow switch must remove power to the elevator(s), served by that machine room, by shunt trip

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Elevators

- Elevator guidelines are in the UFS 3-600-01 para 4-14
- Guidelines are provided for the various types of elevators
  - Electric Traction
  - Direct Plunger Hydraulic
  - Holeless Hydraulic and Roped Hydraulic Elevator
- Each type has a table summarizing the requirements and a Figure illustrating the requirements

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Elevators

Table 4-1 Electric Traction Elevator

ROOM/AREA	PROVIDE SPRINKLER?*	PROVIDE SMOKE DETECTOR TO INITIATE ELEVATOR FIREFIGHTERS' SERVICE AND BUILDING FIRE ALARM SYSTEM
Penthouse Machine Room	Yes	Yes
Elevator Lobbies	Yes	Yes
Pit Area	No	No
Top of Hoistway**	No	No

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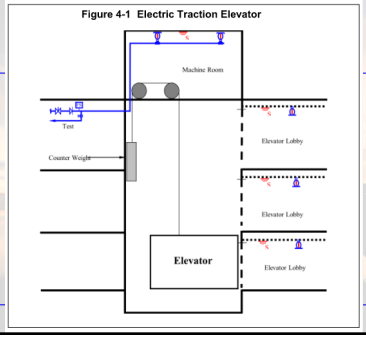
Elevators

Figure 4-1 Electric Traction Elevator



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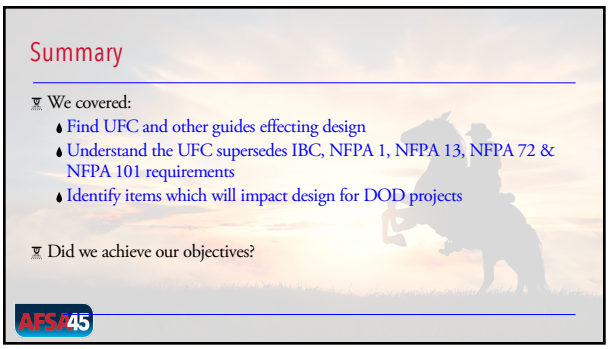
Summary
We covered:
Find UFC and other guides effecting design
Understand the UFC supersedes IBC, NFPA 1, NFPA 13, NFPA 72 & NFPA 101 requirements
Identify items which will impact design for DOD projects
Did we achieve our objectives?
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How UFC 3-600-1 Changes Your Fire Protection Design
Conclusion
Questions and Answers
Thank You for your Attention!
AFSA45

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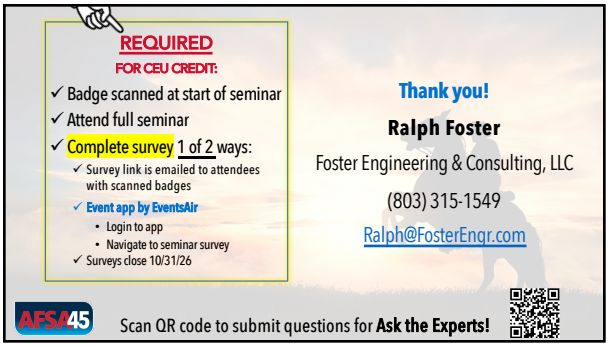
REQUIRED
FOR CEU CREDIT:
✓ Badge scanned at start of seminar
✓ Attend full seminar
✓ Complete survey 1 of 2 ways:
✓ Survey link is emailed to attendees with scanned badges
✓ Event app by EventsAir
• Login to app
• Navigate to seminar survey
✓ Surveys close 10/31/26
Thank you!
Ralph Foster
Foster Engineering & Consulting, LLC
(803) 315-1549
Ralph@FosterEngr.com
AFSA45
Scan QR code to submit questions for Ask the Experts!

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2027 Training Schedule

WEBINARS

1/6	Updates to NFPA 20
1/20	Calculating Pressure Reducing Hose Valves
2/3	Consumer Alert: Nitrogen in Sprinkler Systems
2/17	Reviewing Hydraulic Calculations
3/3	Updates to NFPA 13, 2028 Ed.
3/17	Updates to NFPA 13R & 13D, 2028 Eds.
4/7	Topic Coming Soon
4/21	NFPA 25: Roles & Responsibilities
5/5	Standpipe Flow Test Procedures
5/19	Storage 101
6/2	NFPA Technical Meeting - Voting Guide
6/16	Topic Coming Soon
6/30	Topic Coming Soon
7/7	Updates to NFPA 14, 2027 Edition
7/21	Adjacent Hazards & Design Methods
8/4	Acceptance Testing
8/18	Modifications to Existing Systems
9/22	Topic Coming Soon
10/6	Seismic 101
10/20	Proposed Updates to NFPA 25, 2029 Ed.
11/3	Evaluating Fire Pump Flow Tests
11/17	Top 10 Tech Reviews
12/1	Designing Water Storage Tanks
12/15	Pump Room Layout

PROGRAMS

Feb 9 - Mar 5 Apr 20 - May 14 Aug 3 - Aug 27** Oct 26 - Nov 19	Beginning Design School*
Apr 26 - May 7 Nov 1 - 12	Intermediate Design School*
Feb 8 - 10** Apr 12 - 14 Jul 12 - 14 Oct 11 - 13	Sprinkler Hydraulics Calculations Workshop
Apr 19 - 21 Oct 18 - 20	Advanced Hydraulics Calculations Workshop
Feb 11** Apr 30 Jul 23 Sep 24	Introduction to the Fire Sprinkler Industry
Mar 1 - 3 May 17 - 19 Aug 16 - 18 Oct 18 - 20**	NFPA 25 Essentials Workshop
Jun 7 - 10 Sep 20 - 23	Experienced Inspector Skills Lab
Mar 4 - 5 May 20 - 21 Aug 19 - 20 Oct 21 - 22**	NFPA 25 Fire Pump Workshop
Spring Summer Fall	ITM Inspector Development Program* *This program is 20 months.*

** Hybrid course **At General Air Products Lab, Exton, PA*

AFSA46

September 8-11	Manchester Grand Hyatt San Diego, CA

For More Details Visit:
firesprinkler.org

AFSA
American Fire Sprinkler Association

Dates subject to change. Programs subject to minimum registrations.

rev 9/14/2026

Virtual Instruction Path (VIP)

for Sprinkler Fitting Apprentices

Level 1 - Begins January 2027

Level 2 - Begins February 2027

Level 3 - Begins January 2027

Level 4 - Begins March 2027

www.firesprinkler.org/VIP

AFSA
American Fire Sprinkler Association

HANDS-ON WORKSHOPS FOR 2027

FEATURING AFSA'S TRAINING LAB

NFPA 25 Essentials Workshop

Mar | May | Aug | Oct

Description: Understand roles, responsibilities, and NFPA 25 ITM procedures through hands-on testing of wet systems, dry systems, and fire pumps.

NFPA 25 Fire Pump Workshop

Mar | May | Aug | Oct

Description: Develop practical NFPA 25 fire pump ITM skills, including no-flow and full-flow testing, water supply graphing, and performance evaluation.

Introduction to the Fire Sprinkler Industry

Feb | Apr | Jul | Sep

Description: This course is designed for those new to the industry. An introductory, wide-ranging 8-hour course that provides a broad overview of core fire sprinkler industry concepts for those new to the field.

Experienced Inspector Skills Lab NEW

Mar | Sep

Description: Take your ITM expertise beyond the basics. Designed for experienced technicians, this course combines focused classroom instruction with hands-on system lab training to strengthen your application of current NFPA 25 inspection, testing, and maintenance requirements. Refine fire sprinkler testing practices, improve documentation, deliver more consistent service, and help reduce liability while reinforcing knowledge commonly covered on certification exams.

Learn more about AFSA's fire sprinkler lab featuring functional risers, a spray room, fire pumps, and an interactive classroom.

firesprinkler.org/lab