

# Wisconsin State Fire Inspectors Association April 18, 2018



STATE OF WISCONSIN

DEPARTMENT OF SAFETY AND PROFESSIONAL SERVICES

# Introductions

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# Agenda

- Overview of Safety & Buildings Fire Protection Review
- Requirements for Fire Sprinkler Plan Review
- Key components to look for during plan review
- Field Inspections
- Testing of sprinkler systems
- Questions



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# Overview of Safety & Buildings Fire Protection Review



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# Why is the Department of Safety and Professional Services now performing fire protection plan review?

- Develop uniform procedures and practices throughout the State of Wisconsin
  - All commercial buildings as of January 2012
  - Transferred CBRF review to DHS January 2016 by memorandum of agreement.



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# Why is the Department of Safety and Professional Services now performing fire protection plan review?

- Establish consistency in interpretation and enforcement of the Wis. Admin. Code
  - SPS 361.05 – specifies the adopted code
  - Wisconsin Act 270 – April 2014
    - Established a uniform commercial building code in Wisconsin, while allowing municipalities to grandfather fire detection, prevention, and suppression ordinances that relate to the construction, alteration, or addition to a public building or a building that is a place of employment



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# Why is the Department of Safety and Professional Services now performing fire protection plan review?

## Mandated by Law

**WI Statute 101.12 Approval and inspection of public buildings and places of employment and components.**

**101.12(1)** Except for plans that are reviewed by the department of health and family services under ss. 50.02 (2) (b), 50.025, 50.36 (2), or 50.92 (3m), the department shall require the submission of essential drawings, calculations and specifications for public buildings, public structures and places of employment including the following components:

**101.12(1)(a)** Heating, ventilation, air conditioning and fire detection, prevention or suppression systems.



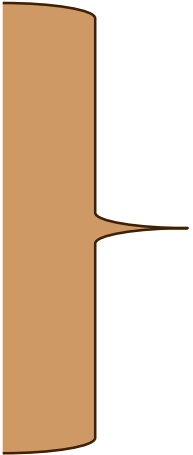
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# Occupancies currently requiring State of Wisconsin plan review

## All occupancies **except** the following:

- CBRF's serving 5-8 unrelated adults (UDC)
- Assembly A-2, A-3
- Business
- Factory F-1, F-2
- Mercantile
- Storage
- Utility and Misc. U



(containing less than 25,000 cubic feet)

SPS 361.30 / IBC 903.2



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# Types of Fire Protection Systems that are reviewed

- Alternative Fire Suppression Systems
- Atrium Fire Protection Systems
- New Automatic Fire Sprinkler Systems and  
Additions or alterations of more than 20 sprinklers
- New Fire Alarm Systems and  
Additions or alterations of more than 20 devices
- Standpipe and Hose Systems



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# Where Plans are Reviewed

## **DSPS Offices**

### **Green Bay Office**

2331 San Luis Place

Green Bay, WI 54304

### **Waukesha Office**

141 NW Barstow Street 4th Floor

Waukesha, WI 53188-3789

### **Madison Office**

1400 E Washington Ave

PO Box 7162

Madison, WI 53707-7162



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# Where Plans are Reviewed

## □ Authorized Representatives

- Certified Municipality (SPS 361.60)
- Appointed Agent (SPS 361.61)

Appleton

Burlington

Grafton

Greendale

Madison

McFarland

Oak Creek

Shorewood Hills

Sun Prairie

Verona

West Allis

Menomonee Falls



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# Requirements for Fire Sprinkler Plan Review



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# Who can prepare fire sprinkler drawings?

- Architects, Engineers or Fire Protection Designers licensed by the Department of Safety and Professional Services (Business credential)
- Automatic Fire Sprinkler Contractor who is licensed by the Department of Safety and Professional Services (Trades credential)



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# General Information

## Required on all Fire Sprinkler Plans

- Plans and calculations shall be signed, sealed, and dated
- All plans shall include the name of the owner and the address of the building
- All plans shall include a plot plan showing the location of the building with respect to the property lines and lot lines, adjoining streets and alleys, as well as other buildings on the same property



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# General Requirements

## Required on all Fire Sprinkler Plans

- Floor plans shall be included showing the location and size of all rooms, doors, windows, walls, partitions, fire walls, and other pertinent information.
- All plans shall include all sections and details necessary to clarify the fire protection system design.



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# General Requirements

## Required on all Fire Sprinkler Plans

- Include all pertinent information required per NFPA 13 (2007)
  - 22.1 (Working Plans) - 46 individual items
  - 22.2 (Water Supplies) - 12 individual items
- Hydraulic calculations shall comply with NFPA 13 (2007):
  - 22.3 (Hydraulic Calculation Forms) - 84 items
  - 22.4 (Hydraulic Calculation Procedures)





# General Requirements Required on all Fire Sprinkler Plans

## □ Equipment Submittals Fire Sprinkler Systems

- It is only necessary to include data sheets for those materials which include specific criteria relative to its listing
  - Sprinklers
  - Cross connection control devices
  - Alarm Check, Dry pipe, Preaction, & Deluge Valves (detection for preaction and deluge required)
  - Fire & Jockey Pumps and Controllers
  - Tanks
  - Pressure Reducing Valves
  - Pipe, Fittings and Hangers



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# Key Components to Look for During Plan Review



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# NFPA 13 Systems

- Sprinklers are required to be installed in all areas throughout a building (NFPA 13: 4.1)



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# NFPA 13 Exceptions

- Combustible concealed spaces per exceptions listed in NFPA 13: 8.15.1.2
  - Need to coordinate with NFPA 13: 11.2.3.1.4 (Hydraulic Calculation Methods) for 3,000 ft<sup>2</sup> remote area.
- Exterior stairways (NFPA 13: 8.15.3.2.4)
- Top of elevator hoistways (non combustible, passenger, ASME A17.1 (NFPA 13: 8.15.5.5)
- Spaces under ground floors, exterior docks, and platforms (NFPA 13: 8.15.6)
  - Need to coordinate with NFPA 13: 11.2.3.1.4 for 3,000 ft<sup>2</sup> remote area.



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# NFPA 13 Exceptions

- Exterior roofs or canopies (NFPA 13: 8.15.7)
  - Noncombustible/limited combustible
  - Exclude from below if exposed surface is noncombustible/limited combustible and contains only sprinklered concealed space or
  - Unsprinklered concealed space if
    - Filled with insulation
    - Non/ limited combustible ceilings attached to the bottom of solid joists to create an enclosed space 160ft<sup>3</sup> or less
    - Small roofs not exceeding 55ft<sup>2</sup>
    - Exterior exit corridors 50% open and noncombustible



# NFPA 13 Exceptions

- Not required in dwelling unit bathrooms not exceeding 55 ft<sup>2</sup>/15 minute separation (NFPA 13: 8.15.8.1)
- Not required in dwelling unit closets that do not exceed 24 ft<sup>2</sup> located in hotels and motels (NFPA 13: 8.15.8.2)
  - Some applicable exceptions for exempted bathrooms and closets are noted in NFPA 13: section 21.20 (Life Safety Code)
- Electrical equipment rooms
  - Approved fire detection system/ 2 hour (IBC 903.3.1.1.1)
  - Dry equipment only, 2-hour, no storage (NFPA 13: 8.15.10)



# NFPA 13R Systems

- Sprinklers are required to be installed in all areas throughout a building (NFPA 13R: 6.9.1)



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# NFPA 13R Exceptions

- Bathrooms not exceeding 55 ft<sup>2</sup>
- Dwelling unit closets not exceeding 24 ft<sup>2</sup>
- Porches, balconies, corridors & stairs that are open and attached
  - SPS 362.0903(9)
    - Exterior balconies, decks and ground-floor patios of dwelling units where the building is of Type V construction, provided there is a roof or deck above shall require sprinkler protection



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# NFPA 13R Exceptions

- Attics, penthouse equipment rooms, elevator machine rooms, concealed spaces exclusively for ventilation equipment, crawl spaces, floor/ ceiling spaces, noncombustible elevator shafts, other concealed spaces not used for living or storage with no fuel fired equipment
- Closets on exterior balconies



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# Fire Sprinkler Plan Review Process

- Owner & Address of Building
- Plans & calculations properly signed
- Site plan, floor plans, cross section plan.
- Equipment submittals provided & listed
- Current waterflow test
- Design criteria & adjustments
- Sprinklers (K-factor, temperature, RTI)
- Control valves & system components



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# Hydraulic Calculation Review Process

- Remote Area identified
- Design area
- Area per sprinkler
- Minimum rate of water application
- Minimum pressure required
- Hose, rack, water curtain allowances
- Friction loss (pipe, fittings, elev., devices)
- Water source



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# Field Inspections



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# Information on Job Site

- Automatic fire sprinkler plans
  - Signed & sealed (SPS 361.31(1)(b))
- Automatic fire sprinkler specifications
  - Material and devices used
  - Settings of pressure reducing valves
  - Type and amount of antifreeze solution used, if any



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# System is Installed per the Plans

- Correct pipe sizes
- Sprinklers are spaced properly
- Appropriate sprinklers installed
- Correct type of pipe installed
- Underground correct size



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# Sprinklers

- Sprinklers free of all paint
- Tape, foil, or other protective covers are removed
- Deflectors have not been bent
- Sprinklers closer than 6 ft to each other
- Sprinklers obstructed



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# Testing of Sprinklers

- Standard response sprinklers in service over 50 years (1968)
- 10 years for dry sprinklers (2008)
- 20 years for quick response sprinklers (1998)
- Sprinklers 325° F or greater shall be tested at five year intervals (2013)
- Sprinklers manufactured prior to 1920 shall be replaced



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# Obstruction to Sprinklers

- Ducts over 4 ft wide (NFPA 13: 8.5.5.3.1)
- Open grate flooring over 4 ft wide
- Overhead doors over 4 ft wide
- Storage closer than 18” to sprinkler deflector  
(NFPA 13: 8.5.6.1 exceptions)



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# Storage Height and Arrangement

- Storage array meets sprinkler design criteria
  - NFPA 13: 12.7 » Chapter 12 thru 20
- Storage height does not exceed system design
- Flue spaces clear and maintained
- Aisles free and proper width
- Correct size sprinkler orifice for design criteria  
(NFPA 13: 12.6 - Storage occupancies)
  - 0.2 or less →  $K=5.6$
  - $> 0.2$  to  $0.34$  →  $K=8.0$
  - $> 0.34$  →  $K=11.2$



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# Fire Suppression Alarms

- Inspectors test connection must have orifice equivalent to smallest sprinkler orifice on the system (NFPA 13: 8.17.4.2.1)
- Alarms sound within appropriate time frame of waterflow (NFPA 13: 6.9.1)
  - Alarm in 5 minutes
  - Minimum flow of 10 gpm
  - 0 to 90 second retard



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# Valves

- Control valve must be indicating type (NFPA 13: 8.16.1.1.2)
- Valves properly supervised (IBC 903.4)
- Valves in the correct position (NFPA 13: 8.16.1.1.2.4)
- Valves are accessible (NFPA 13: 8.16.1.1.7)
- Identification sign for each valve (NFPA 13: 6.7.4.1)



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# Fire Department Connection

- Location acceptable to Fire Chief (IBC 912.2.1)
- FDC is accessible (IBC 912.3)
- Mounting height should be 18” to 48” above grade (NFPA 13: A.8.17.2)
- Caps in place to protect inlets (NFPA 13: 6.8.2)
- No control valve in FDC piping (NFPA 13: 8.17.2.5.2)
- FDC piping arrangement (NFPA 13: 8.17.2.4)



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# Information Left on Site

- As-Built Drawings
- Hydraulic Design Information Sign
- NFPA 25
- Literature and instructions provided by the manufacturer
- Spare sprinklers (NFPA 13: 6.2.9)
  - Dry sprinklers/ stopper
  - Sprinkler list



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# Testing of Sprinkler Systems



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# Fire Service Mains

- Underground service flushed before connection to sprinkler system
  - Minimum flow rates for flushing (NFPA 13: 10.10.2.1.3)
    - Hydraulically calculated water demand rate including any hose requirement
    - Flow necessary to provide a velocity of 10 ft/sec (see Figure 10.10.2.1.3 for flow rates)
    - Maximum flow rate available to the system under fire conditions





# Wet Sprinkler Systems

## □ Hydrostatic test

- 200 psi for 2 hours (NFPA 13: 24.2.1)
- If system has working pressure over 150 psi must test at 50 psi over working pressure
- If the weather is cold an interim air test shall be permitted
- Modifications of 20 or fewer sprinklers don't require testing in excess of system pressure
- Additions or modifications to existing systems shall be isolated and tested
- Modifications that cannot be isolated shall not require testing above system working pressure



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# Wet Sprinkler Systems

- No additives are allowed to be used for stopping leaks (NFPA 13: 24.2.1.9)
- Test blanks shall be removed (NFPA 13: 24.2.1.13)



# Dry Sprinkler Systems

- Must have a standard hydrostatic test  
(NFPA 13: 24.2.1.1)
- Air pressure leakage test (NFPA 13: 24.2.2.1)
  - Test at 40 psi for 24 hours
  - Any loss in excess of 1-1/2 psi shall be corrected



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# Operational Tests

- Working test of dry pipe valve
  - Open ITC and measure time for water to be discharged (NFPA 13: 24.2.3.2.2)
- Testing of deluge or preaction valves
  - per manufacturers instructions (NFPA 13: 24.2.3.3.1)
- Main drain test
  - Per (NFPA 13: 24.2.3.4.1)
- Alarm Test
  - Per (NFPA 13: 24.2.3.1)



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# Questions?

