



# Residential Fire Protection Presentation

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Protection Systems

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## Presentation Outline

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### **I. IRC Mandate**

- a. Problem
- b. Purpose

### **II. Cost**

### **III. IRC P2904**

- I. Differences Between P2904 and NFPA 13D

### **IV. NFPA 13D**

IV. Chapter 1

V. Chapter 2

VI. Chapter 3

VII. Chapter 4

VIII. Chapter 5

IX. Chapter 6

X. Chapter 7

XI. Chapter 8

### **V. Prescriptive Design Method**

### **VI. Questions and Answers**

– U.L. Burn Test to Flashover:

Legacy Rooms =>29.25 Modern Rooms =>3:40

- Larger Homes
- Open Floor Plans
- Increased Fuel Loads
- Void Spaces
- New Construction Materials



There is a fire problem with new residential construction, and this problem is driving the mandate.



## IRC Model Code-Sprinkler Mandate

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### 2009 IRC Ch 3 – Building Planning

- **R313.2 One and two family dwellings automatic fire systems:** Effective January 1, 2011, an automatic residential fire sprinkler system shall be installed in one and two family *dwellings*.

-Research into code adoption has shown that by the time a code is 4 years old, only 33% of jurisdictions actually adopt it. Within 7 years, about 75% adopt it. Within 10 years, almost all jurisdictions do.

-California

[-www.nfsa.org](http://www.nfsa.org)

IRC sprinkler code adoption will not be immediate.



## Residential Sprinkler Cost

- NFPA Cost
  - Report published by Newport Partners (3<sup>rd</sup> Party)
    - [www.nfsa.org](http://www.nfsa.org)
  - Range => \$0.38 to \$3.36 (\$/ft<sup>2</sup>)
  - Average=> \$1.61 (\$/ft<sup>2</sup>)
  - MultiPurpose Average => \$1.04 (\$/ft<sup>2</sup>)





## Residential Sprinkler Cost

- NAHB Cost
  - In a public statement, the NAHB claims that the range of cost can be from \$3.30 to \$8.00 (\$/ft<sup>2</sup>)



- Possible Additional Cost
  - \$6,000 potential water meter up charge to 1" from 5/8"
    - Will be fought, Water Purveyor should not be able to do that.
  - Miscellaneous charges for larger service pipe, alarm circuit, etc.
    - Increased water line may be required to accommodate the potential increase in water flow.

The average cost of a residential MP sprinkler system is 1.04 (\$/ft<sup>2</sup>), but water meter up charges could add cost pending the local water purveyor.





## Residential Sprinkler – NFPA 13D / P2904

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### 2009 IRC Ch 3 – Building Planning

- **R313.2.1 Design and installation.** Automatic residential fire sprinkler system shall be designed and installed in accordance with Section P2904 or NFPA13D.





## Residential Sprinkler - P2904

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- **IRC Section P2904**

- In comparison to NFPA13D, Section P2904 is a simple document (14 Pages vs. 35 in NFPA13D)
- Introduced Prescriptive Sizing, which allows residential sprinkler systems to be sized without the need for calculations.
- Keeps 3/4" nominal minimum tubing size to sprinkler from water source.
  - Network Systems cannot be used
- Cannot use shutoff valves that would isolate one or more sprinklers.
- [www.ircfiresprinkler.org](http://www.ircfiresprinkler.org)

P2904 is a simple document when compared to NFPA 13D, but the IRC states that a system must be designed and installed to either P2904 or NFPA 13D.



## NFPA13D 2010 – Chapter 1: Scope & Purpose

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- NFPA 13D Purpose
  - The purpose of this standard shall be to provide a sprinkler system that aids in the detection and control of residential fires and thus provides improved protection against injury, life loss, and property damage...
  - Prevent Flash Over
- Provide a safe means of escape for occupants.
  - It is only a benefit that a majority of the time the fire is extinguished by the sprinklers.
- Minimizes damage to structure.
  - Firefighters



The purpose of a system designed to NFPA 13D is to extend the time the occupants have to escape safely.



## NFPA13D 2010 – Chapter 3: Definitions

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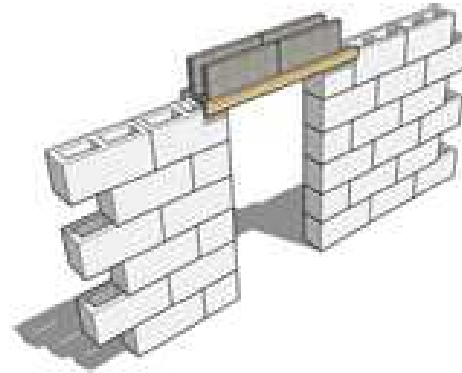
- Multipurpose Piping System => A piping system intended to serve both domestic and fire protection needs.
  - PEX
  - IPS CPVC
  - Copper or iron pipe
  
- Network System => A type of multipurpose system utilizing a common piping system supplying domestic fixtures and fire sprinklers where each sprinkler is supplied by a minimum of three separate paths.
  
- Other Definitions Include:
  - Supply Pressure, System Pressure, Dwelling, Townhouse, Control Valve, Water Flow Alarm, Automatic Sprinkler, Residential Sprinkler

Know the terminology of the industry.



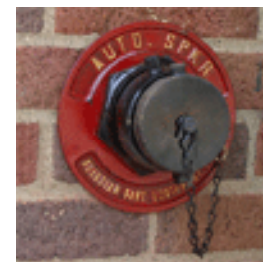
## NFPA 13D 2010 – Chapter 4: General Requirements

- Compartment
  - The design demand area.
    - Lintel



- **Hydrostatic Test**

- Where a fire department connection is not provided, the system shall be hydrostatically tested for leakage at normal operating pressures.
  - Fire Department Connections are rare in residential sprinkler systems.



Know the requirements that a residential sprinkler system must have.



## NFPA13D 2010 – Chapter 5: System Components

- Only new sprinklers shall be installed in sprinkler systems.
- Nonmetallic pipe used in multipurpose piping systems not equipped with a fire department connection shall be designed to withstand a working pressure of not less than 130 PSI at 120°F.
  - **UL 1821** – Thermoplastic Sprinkler Pipe and Fittings for Fire Sprinkler Service
  - CPVC and PEX
- Fittings also must be listed to UL 1821



Zurn PEX tubing (White Only) and applicable fittings are listed to UL 1821 for sprinkler supply.



## NFPA13D 2010 – Chapter 6: Water Supply

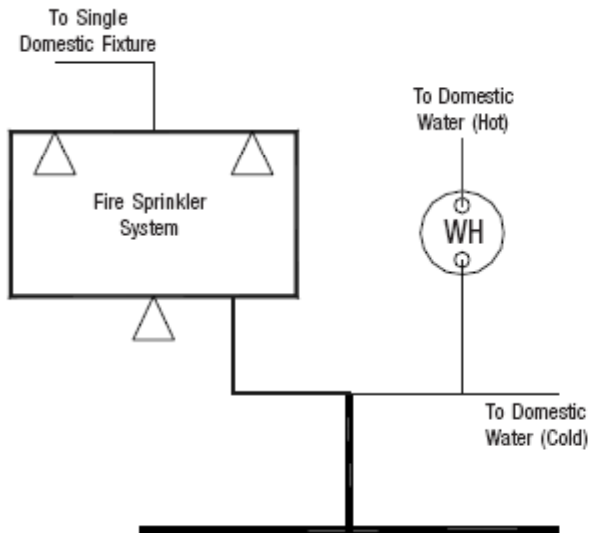
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- Chapter 6 discusses acceptable water supply methods
- **MultiPurpose System**
- A piping system serving both sprinkler and domestic needs shall be considered to be acceptable by this standard where the following conditions are met.
  - All piping in the system supplying sprinklers is listed and conforms to NFPA 13D.
  - Piping that is supplying only a plumbing fixture does not have to be listed for the sprinkler system.
  - If water treatment devices are installed, certain criteria must be met.

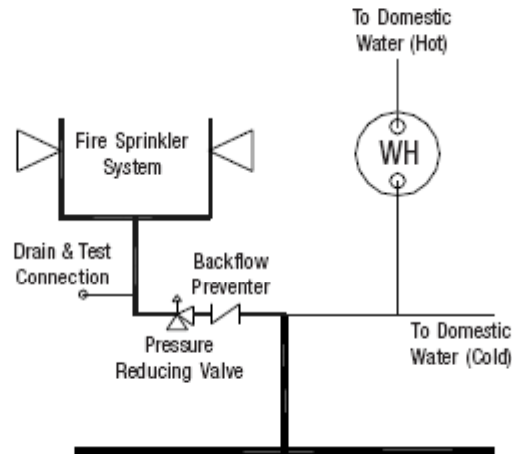
Piping must be listed to UL 1821 if supplying a sprinkler, piping supplying a plumbing fixture only does not have to meet 1821 but still must be meet all local plumbing requirements.



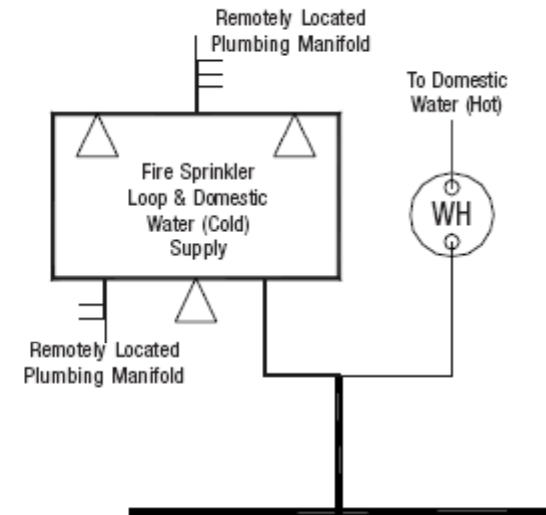
## MultiPurpose System Supply



Passive Purge System



Shared Service Line



Combination System



## NFPA13D 2010 – Chapter 7:Installation

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- Valves – A separate shutoff valve shall be installed for the domestic water supply in installations other than those complying with Section 6.3.
  - Section 6.3 discusses Multipurpose Systems
  - *If a sprinkler system fails to operate during a fire, the primary reason for the failure is that the sprinkler system is turned off.*
- Drain and Test Connections
  - Multipurpose systems are tested daily with use of plumbing fixtures.
- Other Advantages of a MP System Include
  - Lower cost (product & labor) than stand-alone systems
  - Confirmation of working system when cold water is used
  - No stagnant water – no backflow preventer
  - Plumbing and fire protection installed by same contractor

There are many advantages of a MP system versus a stand alone system.



### Piping Support

- Sprinkler Piping shall be supported in a manner that prevents the movement of the piping upon sprinkler activation.
- PEX utilizes nailing flanges on the fitting to prevent upward thrust, where CPVC utilizes more hangers.



Zurn PEX Sprinkler Fitting

PEX in sprinkler systems is supported differently than CPVC.

- Sprinklers
  - Listed Residential Sprinklers shall be used unless other type is permitted.
  - Provide sufficient distance from heat sources
  - Shall not be painted unless supplied by the manufacture
- Types of Sprinklers



Flush Concealed



Recessed Pendant



Concealed Pendant



Horizontal Sidewall

Know sprinkler terminology and installation practices.



## NFPA13D 2010 – Chapter 8:Design

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- Sprinkler Coverage, Position and Obstructions
  - Sprinklers shall be installed in accordance with their listing where the type of ceiling configuration is referenced in the listing.
    - Horizontal or Sloped Ceiling
  - Pendent sprinkler deflectors shall be located 1”-4” away from the ceiling.
  - Pendent and upright sprinklers that have been listed with specific positioning criteria shall be positioned in accordance with their listing unless otherwise permitted.
  - Pendent Sprinklers shall be a minimum of 3’ away from obstructions.
  - Typical sprinkler spacing:
    - 12’ x 12’, 14’ x 14’, 16’ x 16’, 18’ x 18’, 20’ x 20’

Always refer to data sheets to confirm sprinkler is within manufactures listing.





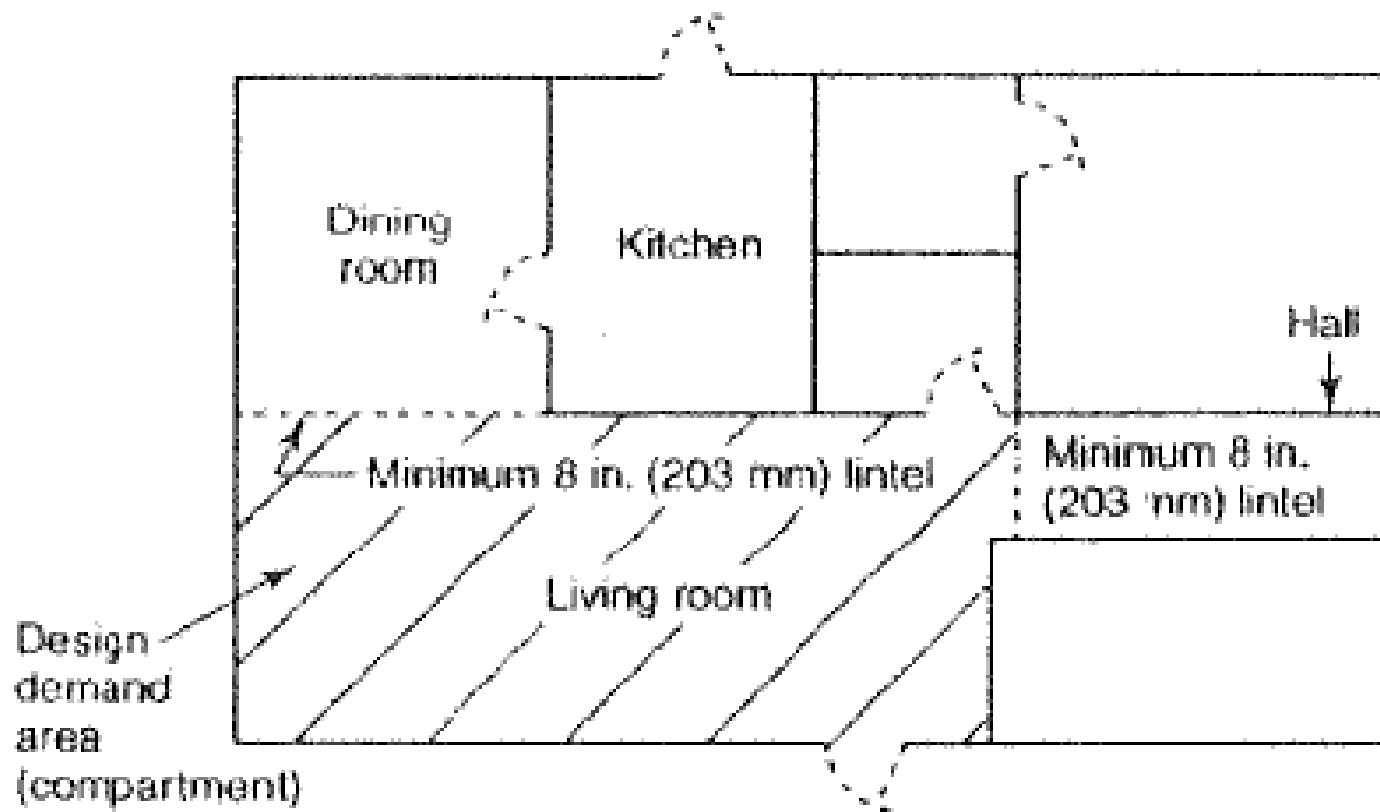
## NFPA13D 2010 – Chapter 8:Design

- Sprinkler Design
  - The system shall provide at least the flow required to produce a minimum discharge density of 0.05 GPM/ft<sup>2</sup>.
  - Under flat, smooth, horizontal ceilings: include all sprinklers within a compartment, up to a maximum of two sprinklers, that require the greatest hydraulic demand.
  - The minimum operating pressure of any sprinkler shall be the higher of the minimum operating pressure specified by the listing or 7 PSI.
- Pipe Sizing
  - The minimum size of pipe other than steel pipe shall be ¾" unless smaller sizes are permitted by 8.4.3.3 (Network Systems)
  - NFPA13D does not require most of the items that are required for Network Systems (Hydraulic calculations shown for each sprinkler, no dead ends, plans, etc.)

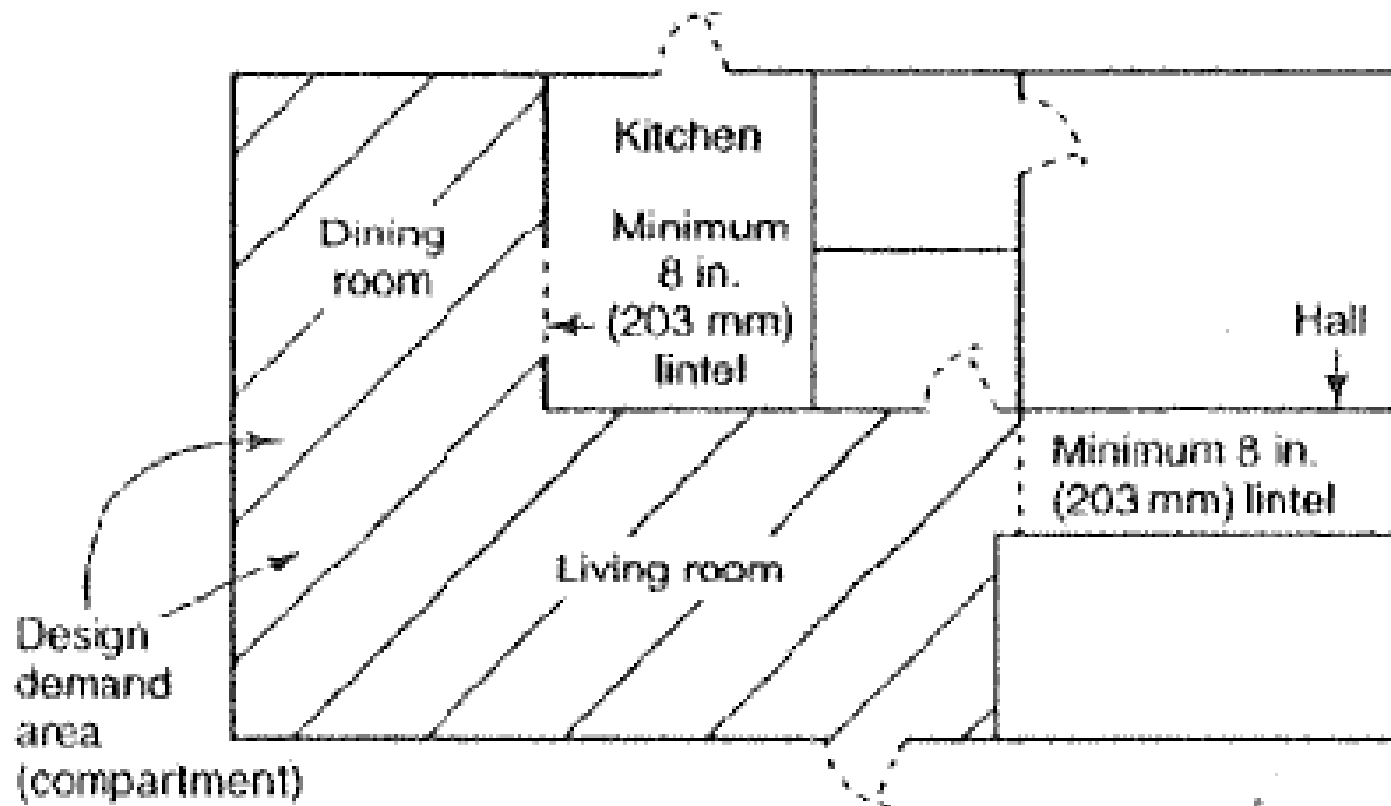
Become familiar with sprinkler system design criteria: The two most hydraulically demanding sprinklers must discharge a minimum of 0.05 GPM/ft<sup>2</sup> at a minimum pressure of 7 PSI.



## Sprinkler Design Areas for Typical Residential Occupancy — With Lintel



## Sprinkler Design Areas for Typical Residential Occupancy — Without Lintel





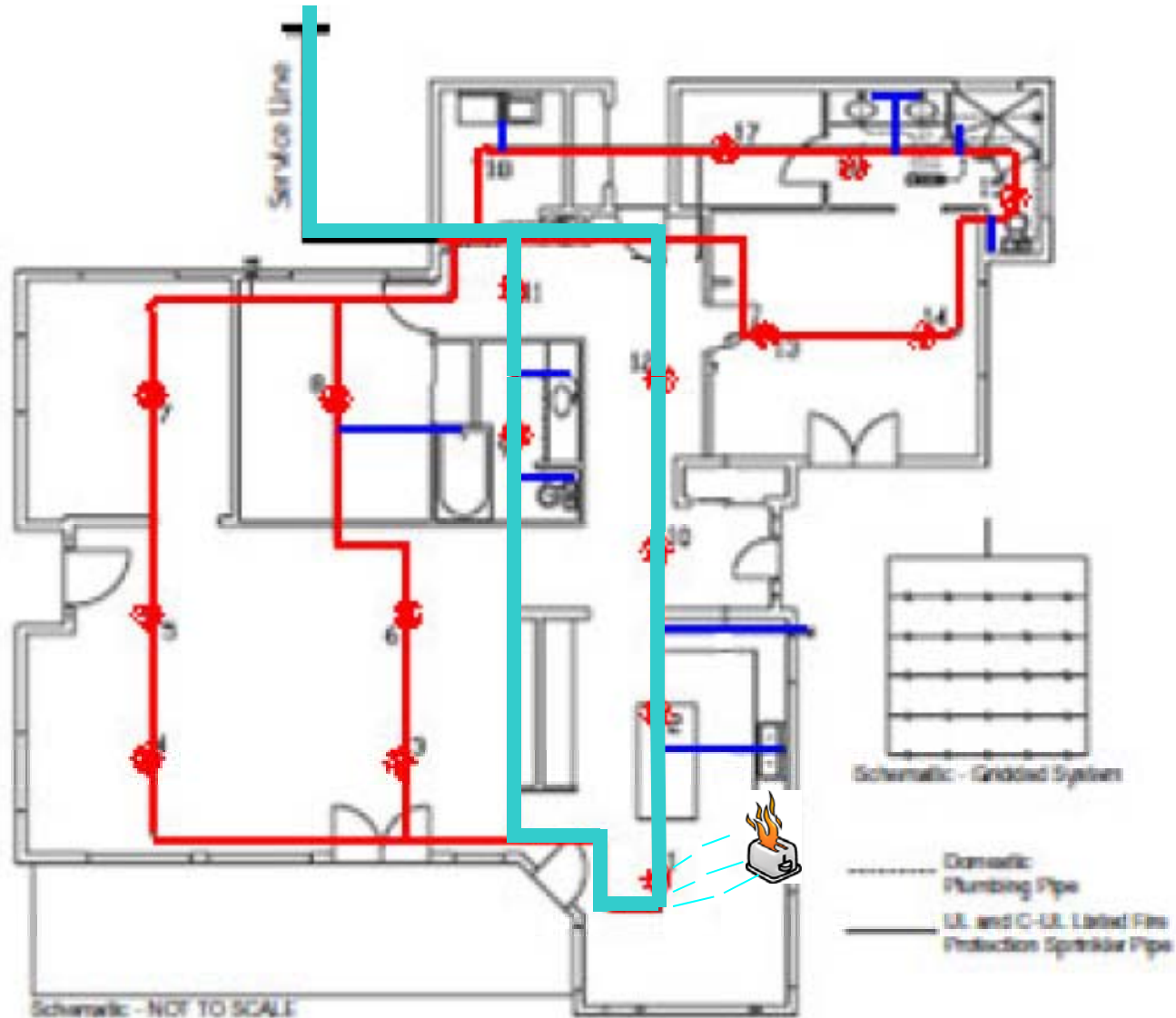
## NFPA13D 2010 – Chapter 8:Design

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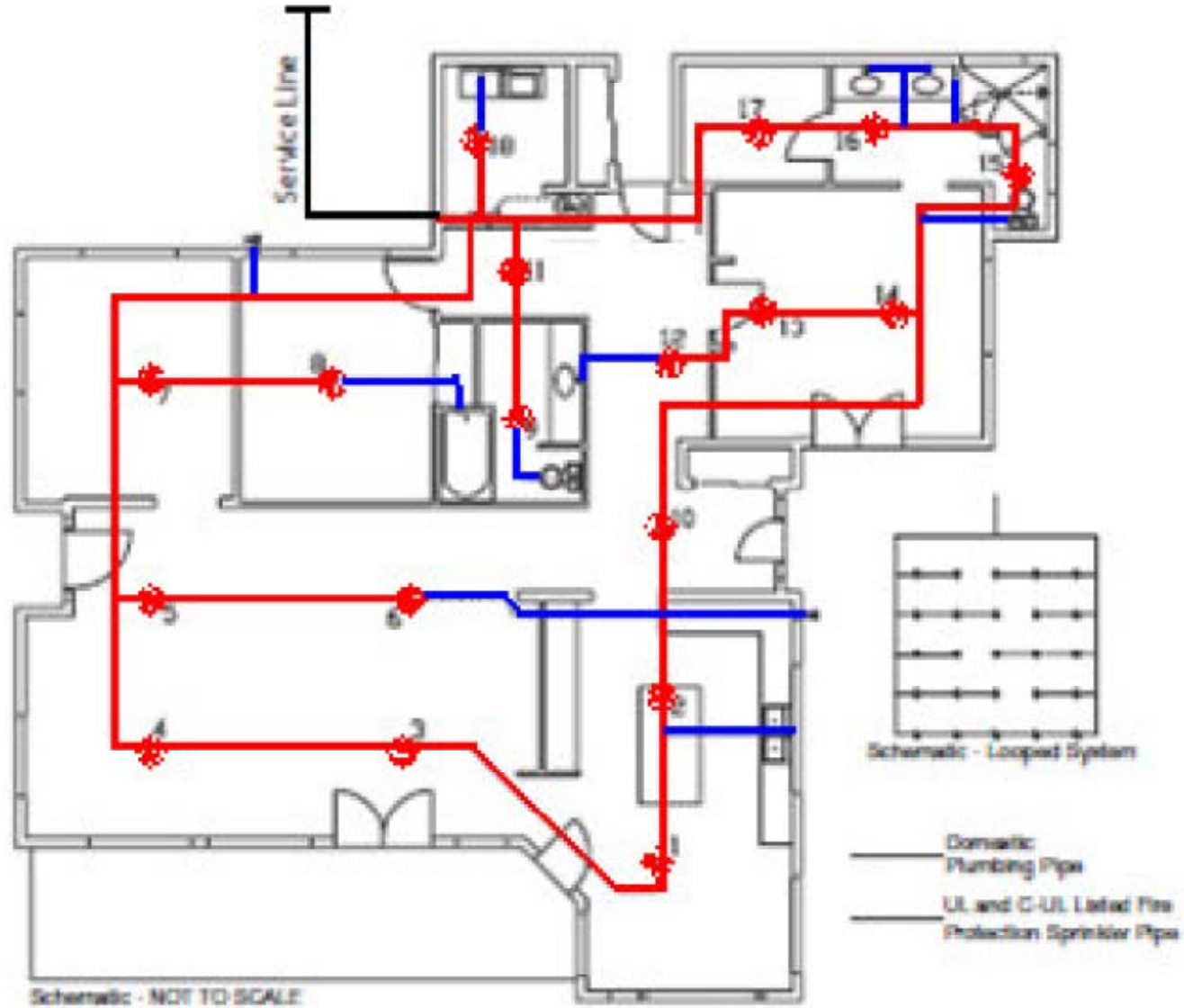
- System Configurations
  - NFPA13D permits multipurpose system configurations to be one of the following:
    - Looped
    - Gridded (Zurn PEX Preferred)
    - Straight Run
    - A combination of the first three
    - Network

A gridded system is preferred due to its simplistic design and favorable hydraulic characteristics.

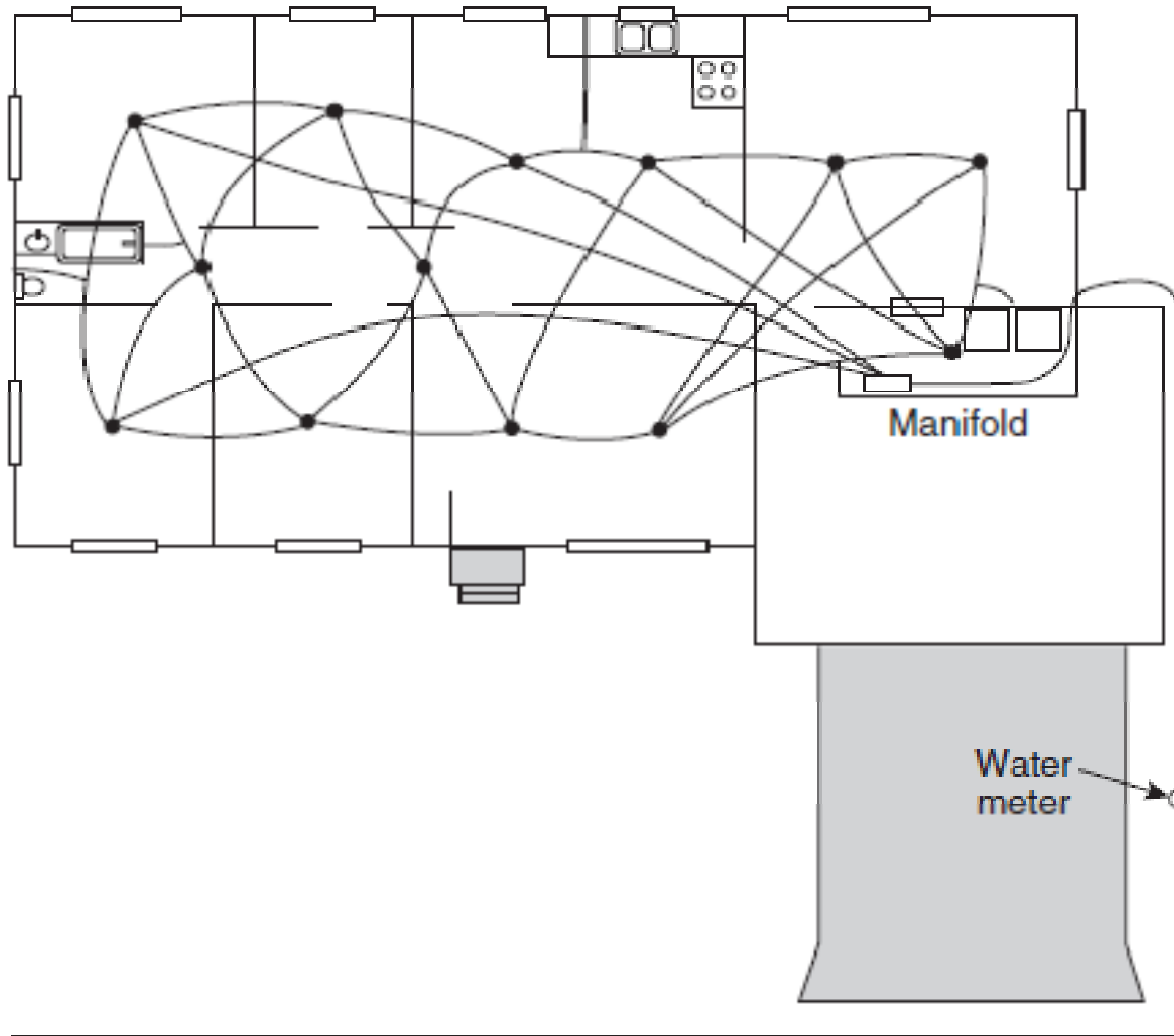




Gridded System



Looped System



Network System



## Prescriptive Design Method

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$$P_t = P_{sup} - PL_{svs} - PL_m - PL_d - PL_e - P_{sup}$$

- Safety Factors are Built into the Prescriptive Method.
  - Typically will increase nominal tubing diameter.
- Already includes valves and fittings.
- Friction loss due to pipe is obtained from charts in P2904.
  - Measured in available length of pipe at the specific flow rates and pressure losses.

Prescriptive Design method is a simplified way to calculate out a sprinkler system.





# Questions?

