Trusted above all.

Welcome to Viking EMEA

Your fire protection partner in
Europe, Middle East and North Africa

Date: 10.11.2014
Speaker: John-Erik Holmli
Place: Iceland

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Agenda

1. The sprinkler market in Norway
   - Statistics
   - Who are the players
   - Commissioning and annual inspections/ maintenance
2. Residential sprinklers
   - Which standards are used ?
   - What is new in the first revision
   - How to do the design.
3. EN12845 - Revision 1
4. Discussion

Viking offers the broadest product range on the market

Components suitable for various applications

Water-based suppression systems

- Storage (warehouses, cold storage)
- Commercial (shopping centres, underground car parks, offices)
- Industrial (manufacturing plants, cable channels, machine tools)
- Residential (retirement homes, residential housing)
- Etc.

Foam-based suppression systems

- Petrochem (e.g. tank farms)
- Energy (e.g. power plants)
- Waste incineration plants
- Airplane hangars & helipads
- Road and train tunnels
- Etc.

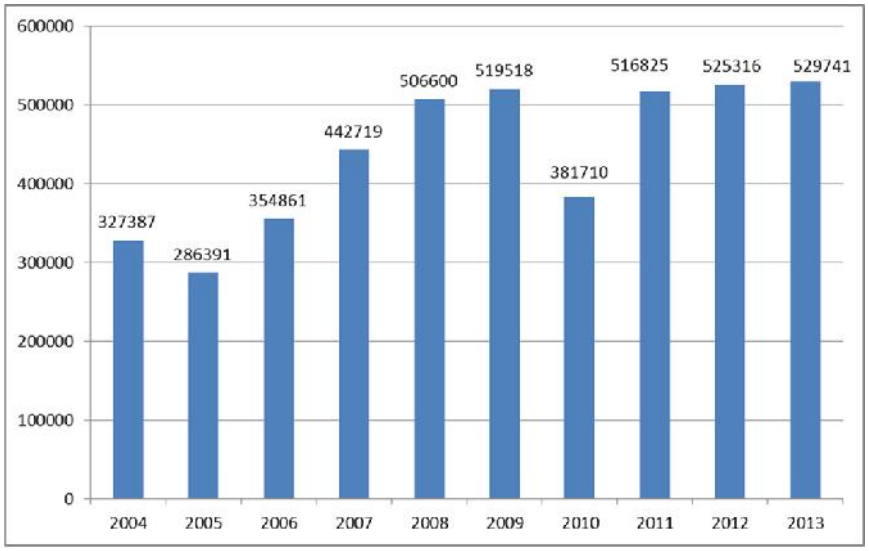
Gas suppression systems

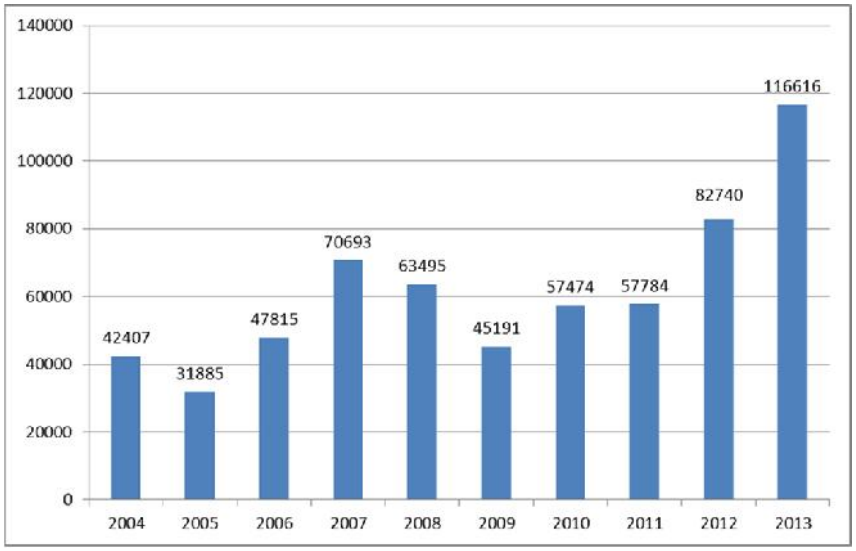
- Data centres & server rooms
- Power distribution and control cabinets
- Cable ducts and cable cellars
- Museums
- Archives
- Laboratories
- Etc.

Fire detection systems

- Airplane & helicopter hangars
- Exhaust gas ducts
- Painting facilities
- Engine test stands
- Petrochem
- Waste incineration plants
- Etc.

Sprinkler Statistics – 2013 - Norway





Commercial Sprinklers

Residential Sprinklers

Water mist Residential	13.963
Rest	7.672

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Sprinkler market - Norway

Directorate for Building Quality (DiBK)

New buildings

Centralized approval of companies

Directorate for Civil Protection (DSB)

Existing buildings

The Norwegian Insurance Approval Board (FG)

Sprinkler market - Norway

Who do what ?

a) A HVAC/ Sprinkler Consutant do the design and take care of the administrative work and a local plumber do the installation.

b) FG Approved sprinkler company do the design and installation.

c) Products for sprinkler instalations are sold through the HVAC wholesellers.

Sprinkler Market - Norway

New Buildings

DIREKTORATET FOR BYGGKVALITET

The Planning and Building Act
(Performance based building codes)

Regulations on technical requirements for building works (TEK10)

Preaccepted solutions

Fire Engineering- Analyzes

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Sprinkler Market - Norway

New Buildings

Regulations on technical requirements for building works (TEK10)

Table: Hazard classes

Hazard classes	Structures designed for only the sporadic presence of people	People in the structure are familiar with the opportunities for escape, including escape routes, and can get to safety unassisted	Structures designed for overnight stays	Intended use of the structure does not represent a serious fire hazard
1	yes	yes	no	yes
2	yes/no	yes	no	no
3	no	yes	no	yes
4	no	yes	yes	yes
5	no	no	no	yes
6	no	no	yes	yes

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Sprinkler Market - Norway

New Buildings

Regulations on technical
requirements for building works (TEK10)

Section 11-12. *Measures that influence evacuation and rescue times*

(1) In structures designed for activities that could result in evacuation and rescue taking a long time, proactive measures shall be implemented that increase the available escape time. The following shall, as a minimum, be complied with:

a) Structures, or parts of structures, in hazard class 4 that require a lift shall have an automatic fire extinguishing system. Parts of a structure with and without automatic fire extinguishing system shall have different fire sections.

b) Structures in hazard class 6 shall have an automatic fire extinguishing system.

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Sprinkler Market - Norway

New Buildings

Sprinkler Market - Norway

New Buildings

Regulations on technical
requirements for building works (TEK10)

Where sprinkler system will be installed the system must be designed and constructed according to EN 12845 Fixed firefighting systems.

In buildings for residential purposes NS-INSTA 900 Residential - Part 1 can be used but with duration of water at least 30 minutes for Type 1 and 2 systems, and at least 60 minutes for Type 3 systems.

..... or any other suitable standard as long as the same level of safety is provided and documented.

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Sprinkler Market - Norway

New Buildings

§ 11-12 Tabell 1: Type sprinkleranlegg i byggverk risikoklasse 4.

Type byggverk		NS-INSTA 900 type 1	NS-INSTA 900 type 2	NS-INSTA 900 type 3	NS-EN 12845
Eneboliger og tomannsboliger Rekkehus med høyst tre etasjer over terreng inklusive loftet, og én kjelleretasje Boliger og fritidsboliger med høyst fire boligenheter og høyst tre etasjer over terreng inklusive loftet, og én kjelleretasje		X			
Bygninger utformet som boliger med høyst åtte etasjer og én kjelleretasje: -Boligsameier, borettslag og lignende -Studentboliger -Internater -Boligbrakker -Terrasseleiligheter -Barnehjem -Fritidsboliger			X		
Bygninger med ni etasjer eller mer, utformet som boliger: -Boligsameier, borettslag og lignende -Studentboliger -Internater -Boligbrakker -Terrasseleiligheter -Barnehjem -Fritidsboliger				X	
Selvbetjente hytter		X			
Kombinerte bygninger (dvs. bygninger med ulike risikoklasser):	Boligdelen		X[1]	X[1]	
	Næringsdelen				X

[1] Bruk tabellen for øvrig for bestemmelse av type.

Sprinkler Market - Norway

§ 11-12 Tabell 2: Type sprinkleranlegg i byggverk risikoklasse 6.

Type byggverk		NS-INSTA 900 type 1	NS-INSTA 900 type 2	NS-INSTA 900 type 3 [1]	NS-EN 12845
Arrestlokaler og fengsel					X
Asylmottak og transittmottak				X	
Bolig beregnet for personer med behov for heldøgns pleie og omsorg i:	Eneboliger og tomannsboliger Rekkehus med inntil tre etasjer over terreng inklusive loftet, og én kjelleretasje	X			
	Andre bygninger			X	
Bolig spesielt tilrettelagt og beregnet for personer med funksjonsnedsettelse i:	Boliger med høyst fire boligenheter og inntil tre etasjer og én kjelleretasje	X			
	Andre bygninger inntil 8 etasjer		X		
	Andre bygninger med 9 etasjer eller mer			X	
Feriekoloni og leirskole				X	
Overnattingssted og hotell					X[2,3]
Pleieinstitusjon og sykehjem					X[2,3]
Sykehus					X[3]
Turisthytte og vandrerhjem				X	

[1] Unntak for usprinklede loft i *NS-INSTA 900* gjelder kun loft over én branncelle.

[2] Beboelsesrom og tilhørende rømningsveier kan sprinkles etter *NS-INSTA 900* type 3.

[3] Det skal benyttes hurtigutløsende (QR-quick response) sprinklere for beboelsesrom og tilhørende rømningsveier.

Sprinkler Market - Norway

Existing Buildings

Directorate for Civil Protection (DSB)

- Daily / weekly checks (normally done by the owners reprsentatives)
- Maintenance according EN12845, INSTA900-1 and manufacturer guidelines
- Annual inspection to confirm comformity to standards and that the use of the building is according to the applicable design and installation.

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Residential Sprinklers

Which Standards ?

NFPA13D = INSTA900-1; Type 1

NFPA13R = INSTA900-1; Type 2

NFPA13 = INSTA900-1; Type 3

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

INSTA900-1 - 1st. revision 2013

Residential sprinkler systems – Part 1: Design, installation and maintenance
(DK) Boligsprinkling – Projektering, installation og vedligeholdelse
(IS) Heimilisúðakerfi – Hönnun, uppsetning og viðhald
(NO) Boligsprinkler – Dimensjonering, installering og vedlikehold
(SE) Boendesprinkler – Utförande, installation och underhåll
(SF) Asuntosprinklerilaitteistot – Suunnittelu, asentaminen ja kunnossapito

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

1 Scope

This standard does not necessarily cover all legislative requirements.
National requirements regarding residential occupancies are mandatory.

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

3.20 residential compartment
a space completely enclosed by walls and a ceiling. Openings to an adjoining space are allowed, provided the openings have a minimum lintel depth of 210mm from the ceiling. The total width of openings in a single wall shall not exceed 2.4 m. A single opening of 900mm or less in width without a lintel is allowed when there are no other openings to adjoining spaces

3.21 residential occupancies
any part of a building containing dwellings units only, including common areas such as entrance area, technical rooms and separate small storage rooms used only by the residents. Garages are not included, except where otherwise specified in this standard (covered by EN 12845)

3.29 wardrobe
furniture, such as portable units, cabinets, and similar features not intended for occupancy.

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

5 Extent of sprinkler protection

5.1 Buildings and areas to be protected

Where a building is to be sprinkler protected, all areas of that building or of a communicating building shall be sprinkler protected, except as indicated in 5.1.1 and 5.1.2 and with the acceptance of the national authority having jurisdiction in each case.

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

5.1.3 Design Criteria — Outside Dwelling Unit

Areas to be sprinklered outside the dwelling unit shall comply with specifications in EN 12845.

Exception: Where compartments have an area of 50 m2or less and a ceiling height not exceeding 3 m with 30 minutes fire-rated construction, the design criteria shall be according to Type 3 systems

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What has changed in 1st revisison of INSTA900-1 ?

12.2 Wardrobe

In all wardrobes, including those wardrobes housing mechanical equipment, that are not larger than 11 m3 in size, a single sprinkler at the highest ceiling space in the wardrobe shall be sufficient without regard to obstructions.

Sprinklers are not required in wardrobes and linen closets within dwelling units, where the area of the space does not exceed 2,0 m2 and the smallest dimension does not exceed 0,9 m.

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Residential Sprinklers

What has changed in 1st revisison of INSTA900-1 ?

17 Pipe work
17.1 Pipe system
17.1.1 Installation
Adequate precautions shall be taken to prevent mechanical damage to piping. All piping shall be installed according to relevant national standards. The manufacturer shall provide documentation confirming that the pipe system is suitable for its purpose.

17.2 Pipe supports
17.2.1 General
The pipe supports shall be according to the manufacturer's specification and to the applicable test methods for the pipe system used.

20.1.1 Spare sprinklers
The installer shall deliver a cabinet with spare parts and a sprinkler key(s). The cabinet shall hold:
— for Type 1 installations, two sprinklers of each installed type;
— for Type 2 and 3 installations, 3 sprinklers of each installed type.

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Residential Sprinklers

Design.

- The difference between commercial and Residential sprinklers is that the commercial sprinkler is designed to limit a fire's growth by controlling its size.

- Residential sprinklers however are designed to keep a dwelling space tenable, meaning that it will allow the occupant to exit the space before becoming incapacitated.

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Residential Sprinklers

Design.

- One measure is maintaining the oxygen level at 19.5 percent. Any measurement below that, then the occupant will become disoriented and possibly pass out.

- Residential sprinklers are designed to stop fire growth and maintain tenable conditions in the room for 10 minutes.

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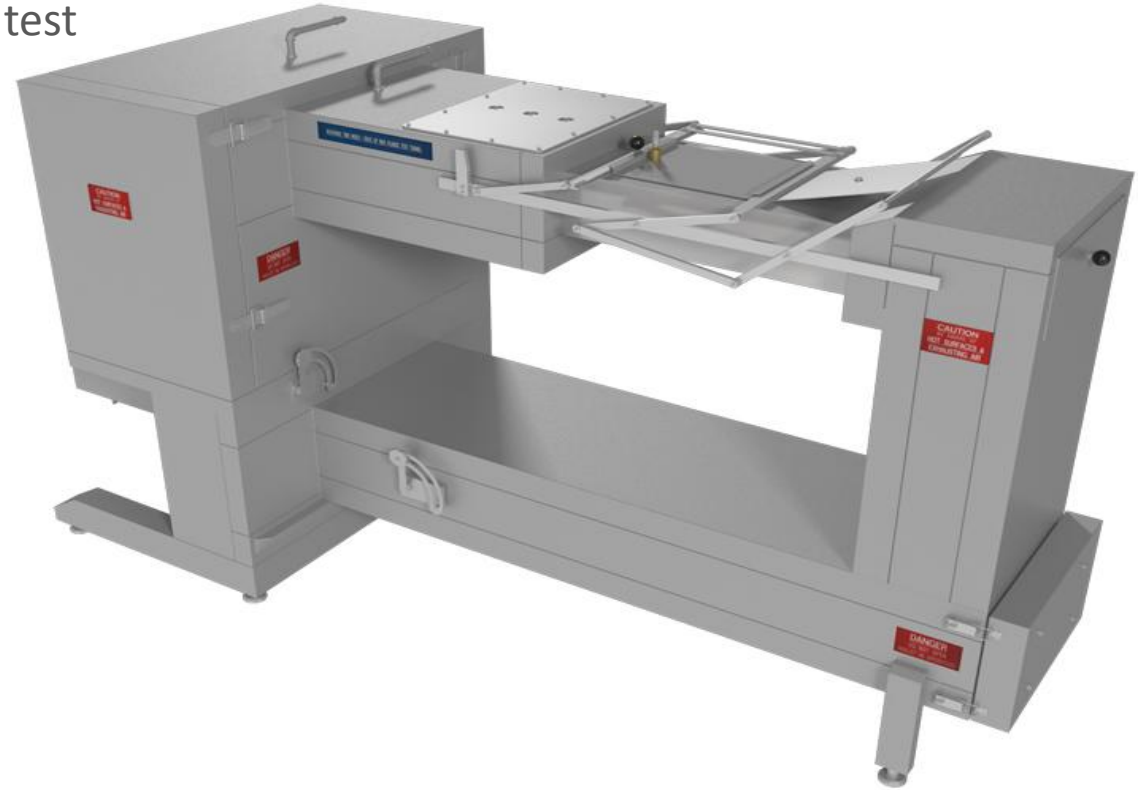
UL 1626 – Sensitivity Test

Thermal Sensitivity

Standard Response
- 3 minutes 51 second room fire test
- 100 seconds plunge test

Quick Response
- 75 second room fire test
- 14 second plunge test

Residential
- Special fire test
- 14 second plunge test



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UL 1626 – Fire Test

Fire Test

- Each Residential sprinkler is required to pass a specific fire test.
- Temperature cannot exceed 316 degrees C (600 degrees F)
- The maximum temperature at 1.6m (5’-3”) cannot exceed 93 degrees C (200 degrees F)
- The area at 1.6m (5’-3”) also cannot exceed 54 degrees C (130 degrees F) for more than 2 minutes.
- Maximum temperature for ceiling material 6.4 mm (¼” inch) behind finished ceiling cannot exceed 260 degrees C (500 degrees F)
- Always 3 Residential sprinklers installed. Third sprinkler at door cannot operate!
- All coverage areas tested this way.

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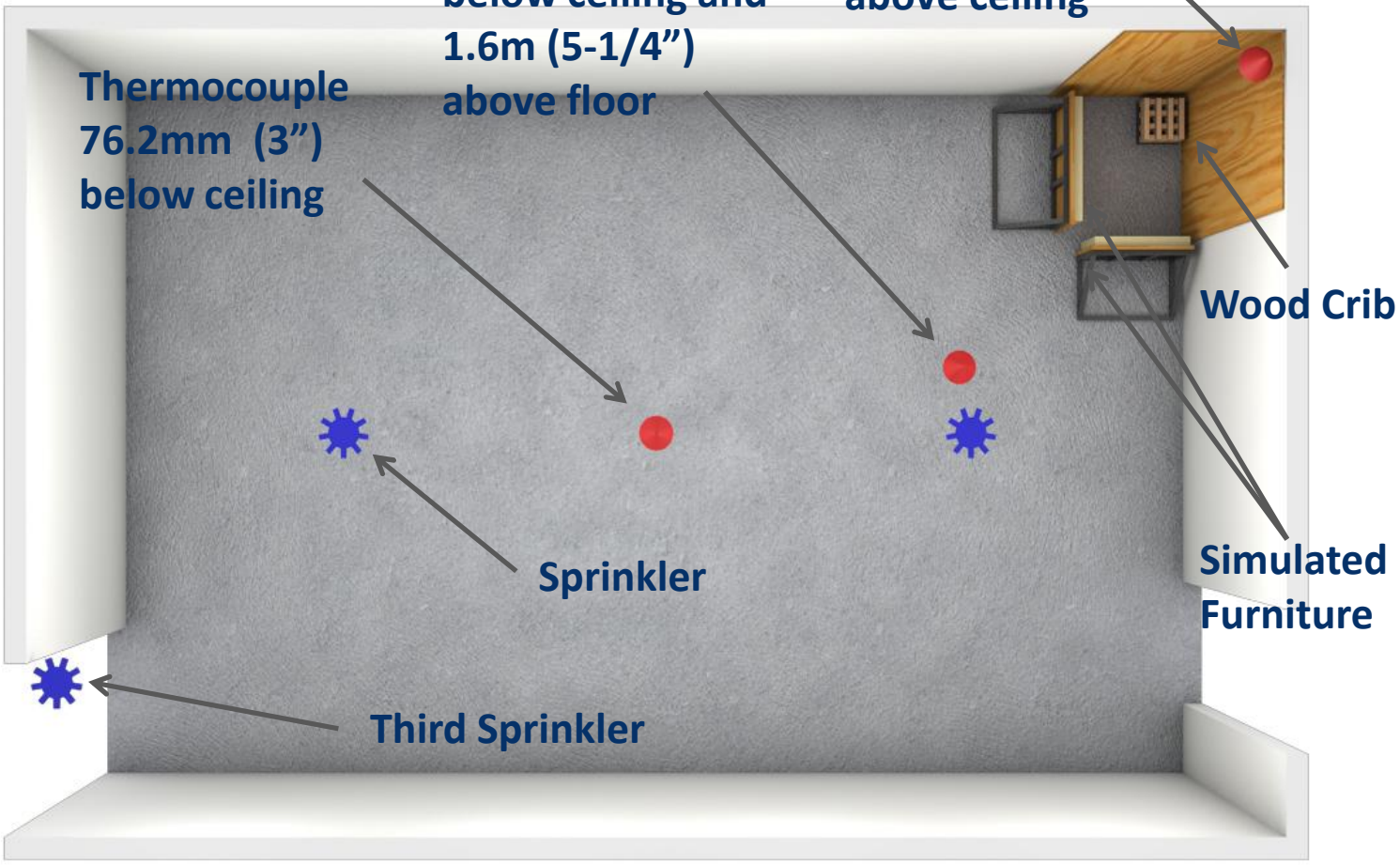
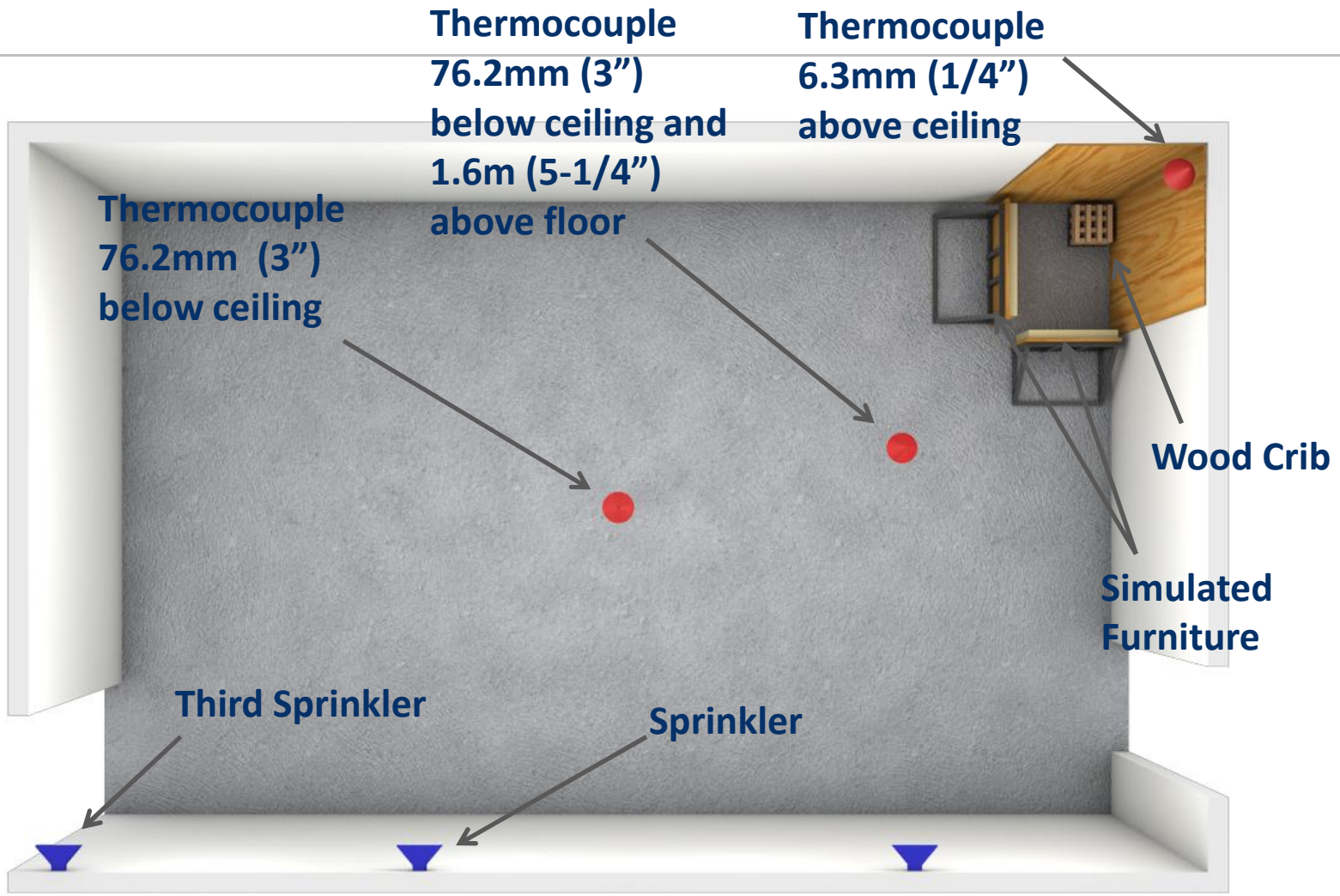
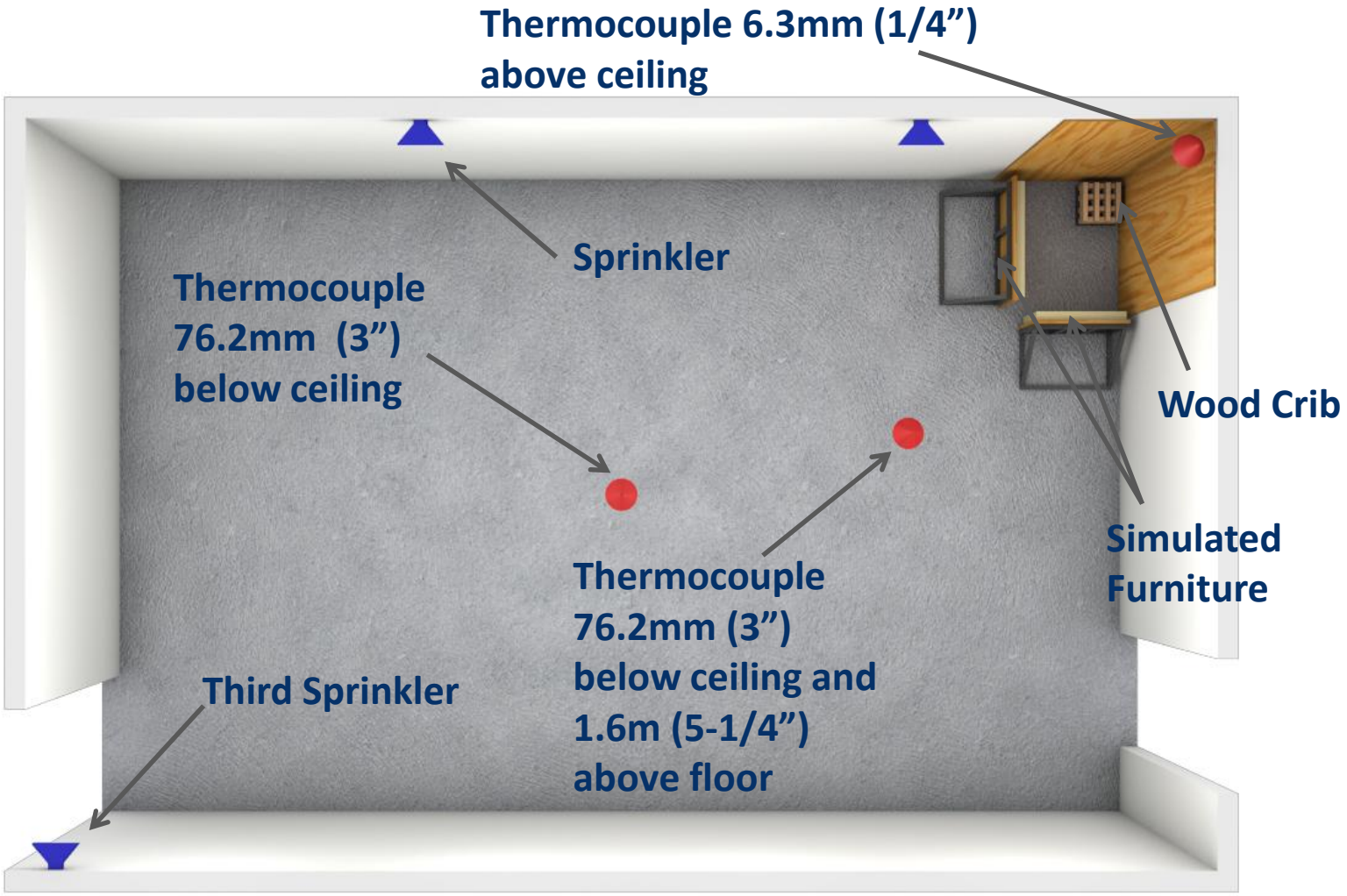
Residential Pendent UL Testing Layout



Residential HSW UL Testing Layout 1



Residential HSW UL Testing Layout 2



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UL 1626 – Water Distribution

Water Distribution Test

- Wet the wall within coverage area 711mm (28”) maximum down from the ceiling
- Residences typically have furnishings placed along the walls
- Sidewall sprinklers must direct 5% of discharge upon the wall in which they are installed.
- Higher, flatter wall wetting pattern, smoke/ heat control, etc…
  - Obstructions must be avoided
    - Sloped ceilings
    - Beams
    - Ceiling fans
    - Lights

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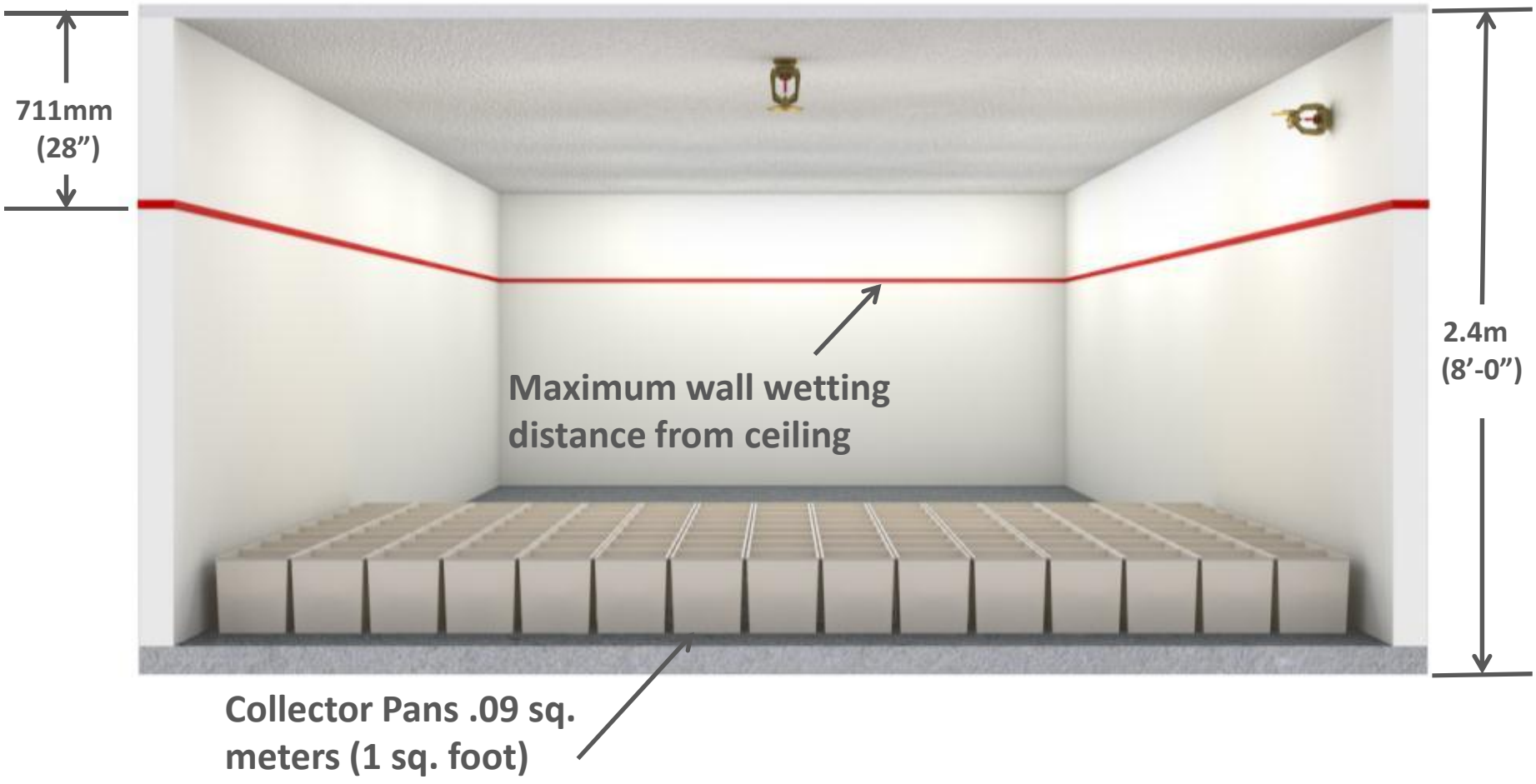
UL 1626 – Water Distribution

Water Distribution Test



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Residential Sprinklers

Design.

Table 2 — Minimum design criteria

Type of residential sprinkler system	Minimum design discharge density (mm/min)	Number of design sprinklers	Minimum duration of water supply (minutes)
1	2,04	1-2 [a]	10
2	2,04	1-4 [a]	30
3	4,08	4	30

[a] The number of design sprinklers required is defined in 7.3.

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History of Residential Sprinkler Systems

- The faster fire growth reduces the time to flashover, which severely reduces the odds of anyone in the home surviving.

- In a fire growth, when the ceiling temperature reaches 594 degrees C (1,100 degrees F), the smoky layer and CO (Carbon Monoxide) reach their auto ignition temperature of 316 degrees C (600 degrees F), at that point, you reach flashover for the room where the entire room becomes engulfed in fire.

To illustrate how the materials used in furniture, floor coverings, wall coverings, etc, have lessened the time to escape a fire,
- In 1975, the average time was 17 minutes, by 2003, that time dropped to 3 minutes!

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History of Residential Sprinkler Systems

NFPA 13D changes explained

2007 Edition – New spacing and obstruction rules were added for sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets.

Ceiling Fan obstructions – Research conducted by the NFSA (National Fire Sprinkler Association) at The Viking Corporation involved distribution of 3 different type of fans.

- Flush Housing
- Suspended Housing
- Large Blades (50% of area)

Based on results:
Minimum distance from a sprinkler to centerline of ceiling fan needs to be 914mm (3'-0") for pendents and 1.52m (5'-0") for sidewalls

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History of Residential Sprinkler Systems

NFPA 13D changes explained

2007 Edition – New spacing and obstruction rules were added for sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets.

Unprotected Ceiling Pockets

- Volume cannot exceed 2.83 cubic meters (100 cu. Ft.)
- Entire floor area protected by sprinklers at lower elevation
- Each pocket separated by adjacent pocket by at least 10’-0” horizontal distance
- Pocket finish is non-combustible or limited combustible
- Skylights not exceeding 2.97 sq. meters (32 sq. ft.) shall be permitted to have plastic cover.

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History of Residential Sprinkler Systems

NFPA 13D changes explained

2007 Edition – New spacing and obstruction rules were added for sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets.

Section 8.1.3.1.3.1 Where the ceiling is sloped, the maximum S dimension shall be measured along the slope of the ceiling to the next sprinkler, as shown in 8.1.3.1.3.1

Section 8.1.3.1.3.2 The sprinklers shall maintain the minimum listed spacing, but not less than 2.44m (8ft.), measured in plan view from one sprinkler to another.

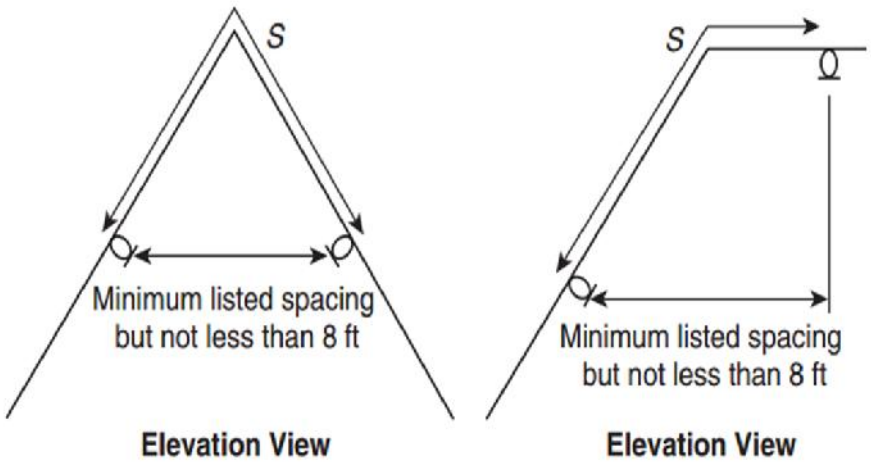

FIGURE 6.8.1.3.1.1(A) Measuring *S* Dimension.

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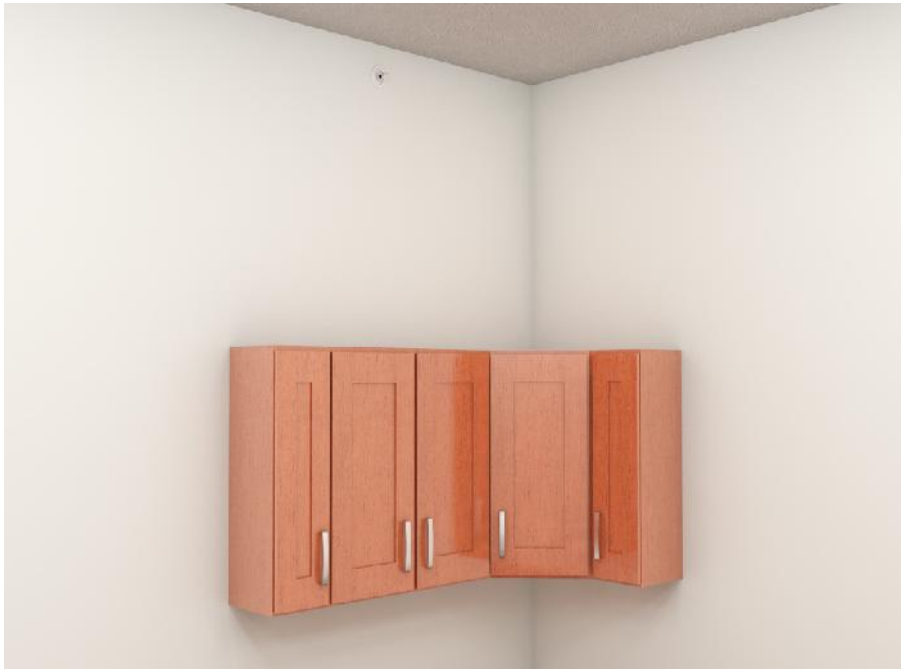
History of Residential Sprinkler Systems

NFPA 13D changes explained

2007 Edition – New spacing and obstruction rules were added for sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets.

Section 8.2.5.6.3 Where sidewall sprinklers are more than 0.91m (3ft.) above the top of cabinets, the sprinkler shall be permitted to be installed on the wall above the cabinets where the cabinets are not greater than 305mm (12in.) form the wall.



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History of Residential Sprinkler Systems

NFPA 13D changes explained

2007 Edition

- Compartment Definition – See Section 4.1
- 4.1.1 - A space completely enclosed by walls and a ceiling
- 4.1.2 – Compartment enclosure permitted to have openings in walls, provided the openings have a minimum lintel depth of 203mm (8 in.) from the ceiling

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History of Residential Sprinkler Systems

NFPA 13D changes explained

2010 Edition Section 3.3.1 Compartment – A space completely enclosed by walls and a ceiling. Each wall in the compartment is permitted to have openings to an adjoining space if the openings have a minimum lintel depth of 203mm (8in.) from the ceiling and the total width of openings in a single wall does not exceed 2.44m (8ft.) in width. A single opening of 914mm (36in.) or less in width without a lintel is permitted when there are no other openings to adjoining spaces.

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History of Residential Sprinkler Systems

NFPA 13D changes explained

2010 Edition – Issuance of TIA 1028-R which removed sloped and beamed ceiling listings in certain instances

2013 Edition – Language based from TIA 1028-R was added to the standard itself, with minor revisions.

- Previous editions – Flat, Smooth, Horizontal ceilings only

- (2010) 8.1.3.1.1 – Sprinklers shall be installed in accordance with their listing where the type of ceiling configuration is referenced in the listing.

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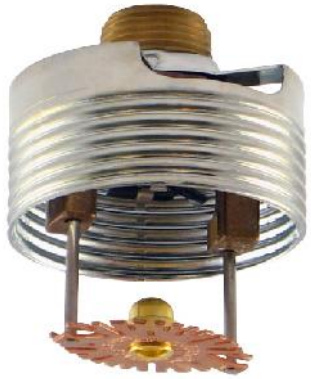
History of Residential Sprinkler Systems

NFPA 13D changes explained



- Multiple sprinklers had different listings based on different ceiling configurations

Viking VK457

Installed below smooth, flat, horizontal ceilings, including ceilings with slopes up to and including 9.5° (2/12)

6.1m x 6.1m (20’-0” x 20’-0”) – 75.7lpm (20gpm) @ 1.15bar (16.7 psi)

Installed below ceilings with slopes up to and including a 33.7° (8/12) pitch.

6.1m x 6.1m (20’-0” x 20’-0”) – 117.3lpm (31gpm) @ 2.76bar (40psi)

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History of Residential Sprinkler Systems

NFPA 13D changes explained

Approval Chart
Residential Concealed Pendent Sprinkler VK457
For systems designed to NFPA 13D[7] or NFPA 13R.
For systems designed to NFPA 13, refer to the design criteria on page 147x.

KEY: AW1 ← Cover Plate Finish; Cover Plate Temperature Rating; Sprinkler Temperature Rating

Sprinkler Base Part Number[1]	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure
		Inches	mm	U.S.	metric[2]	
14694A	VK457	1/2	15	4.9	70.6	175 psi (12 bar)

Maximum Areas of Coverage[6]	Minimum Water Supply Requirements[6]	Listings and Approvals[3] (Refer also to Design Criteria on page 147x.)		
		cULus[4]	NYC	NSF[9]
Installed below smooth, flat, horizontal ceilings, including ceilings with slopes up to and including 2/12 (9.5°).				
12 ft. x 12 ft. (3.7 m x 3.7 m)	13 gpm @ 7.0 psi (49.2 L/min @ 0.48 bar)	AX1	See Footnote 5.	AX1
14 ft. x 14 ft. (4.3 m x 4.3 m)	13 gpm @ 7.0 psi (49.2 L/min @ 0.48 bar)	AX1	See Footnote 5.	AX1
16 ft. x 16 ft. (4.9 m x 4.9 m)	13 gpm @ 7.0 psi (49.2 L/min @ 0.48 bar)	AX1	See Footnote 5.	AX1
18 ft. x 18 ft. (5.5 m x 5.5 m)	17 gpm @ 12.0 psi (64.4 L/min @ 0.83 bar)	AX1	See Footnote 5.	AX1
20 ft. x 20 ft. (6.1 m x 6.1 m)	20 gpm @ 16.7 psi (75.7 L/min @ 1.15 bar)	AX1	See Footnote 5.	AX1
Installed below ceilings with slopes[8] up to and including a 8/12 (33.7°) pitch. Refer to Figure 5 on page 147z.				
		UL	NYC	NSF[9]
16 ft. x 16 ft. (4.9 m x 4.9 m)	26 gpm @ 28.2 psi (98.4 L/min @ 1.94 bar)	AX1	See Footnote 5.	AX1
18 ft. x 18 ft. (5.5 m x 5.5 m)	31 gpm @ 40.0 psi (117.3 L/min @ 2.76 bar)	AX1	See Footnote 5.	AX1
20 ft. x 20 ft. (6.1 m x 6.1 m)	31 gpm @ 40.0 psi (117.3 L/min @ 2.76 bar)	AX1	See Footnote 5.	AX1

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History of Residential Sprinkler Systems

NFPA 13D changes explained

NFPA 13D 2010 Section 8.1.3.1.2 Where construction features exist that are outside the scope of sprinkler listings, listed sprinklers can be installed beyond their listing limitations.

A.8.1.3.1.2 Construction features such as large horizontal beamed ceilings, sloped ceilings having beams, and steeply sloped ceilings are outside of the current listings. In these situations, sprinklers can be installed in a manner acceptable to the authority having jurisdiction to achieve the results specified in this standard.

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History of Residential Sprinkler Systems

NFPA 13D changes explained

Approval Chart 1
Viking VK457, 4.9 K-Factor Residential Concealed Pendent Sprinkler
For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria on page 147y. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number [1]	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure		
		Inches	mm	U.S.	metric [2]			
14694AC	VK457	1/2	15	4.9	70.6	175 psi (12 bar)		
Max. Coverage Area [6] Width X Length Ft. X Ft. (m X m)	Ordinary Temp Rating (165 °F/74 °C)		Deflector to Ceiling	Installation Type	Listings and Approvals[3]			Minimum Spacing Ft. (m)
	Flow [6] GPM (L/min)	Pressure [6] PSI (bar)			cULus [4]	NYC	NSF [8]	
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)	Refer to Figure 2 on page 147z	Concealed with Cover Plate Assembly	See Foot-note 7 and 10	See Foot-note 5	See Foot-note 7 and 10	8 (2.4)
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)						
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)						
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)						
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)						

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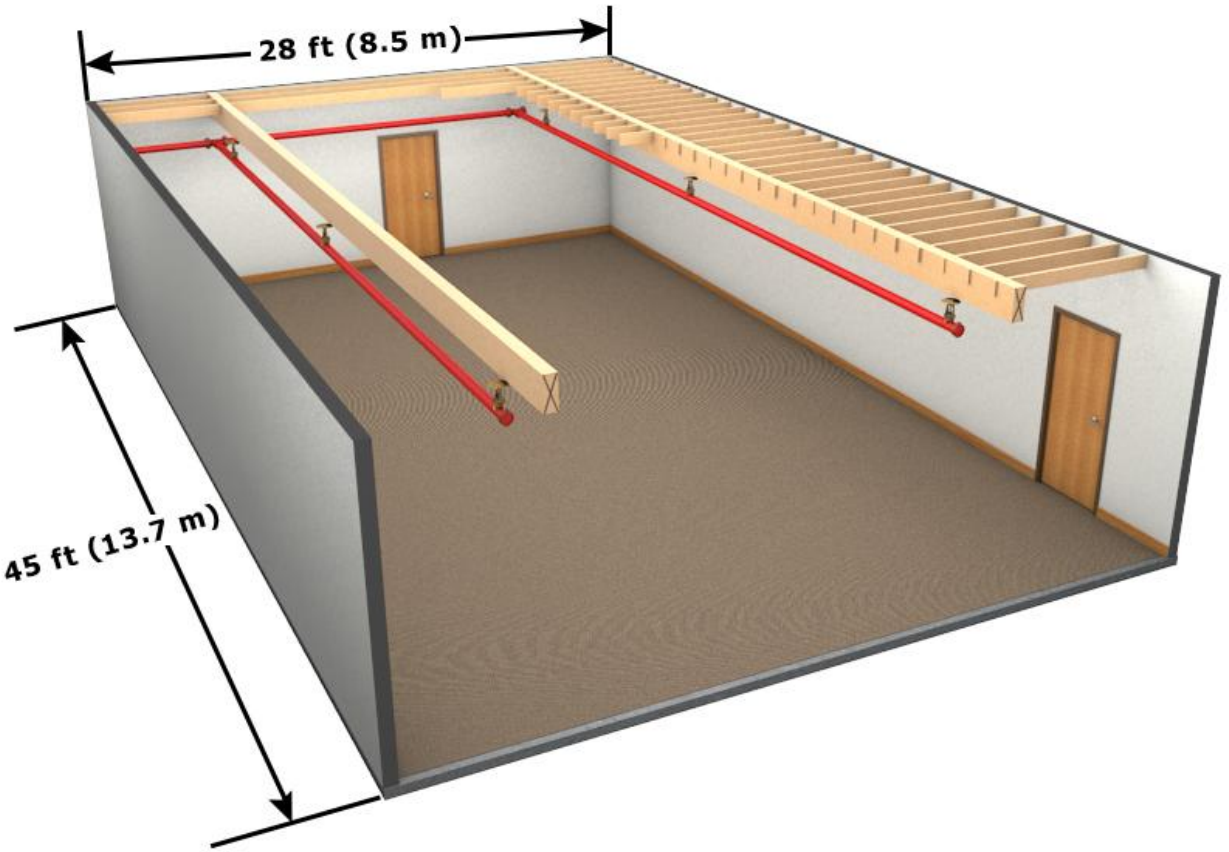
History of Residential Sprinkler Systems

NFPA 13D changes explained

NFPA 13D 2013 10.2.3 For Situations not meeting one of the conditions in 10.2.1, residential sprinklers listed for use in specific ceiling configurations shall be permitted to be used in accordance with their listing.



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History of Residential Sprinkler Systems

NFPA 13D changes explained

NFPA 13D, 2013 Section 3.3.9 Shadow Area. The dry floor area within the protection area of a sprinkler created by the portion of sprinkler discharge that is blocked by a wall or partition.

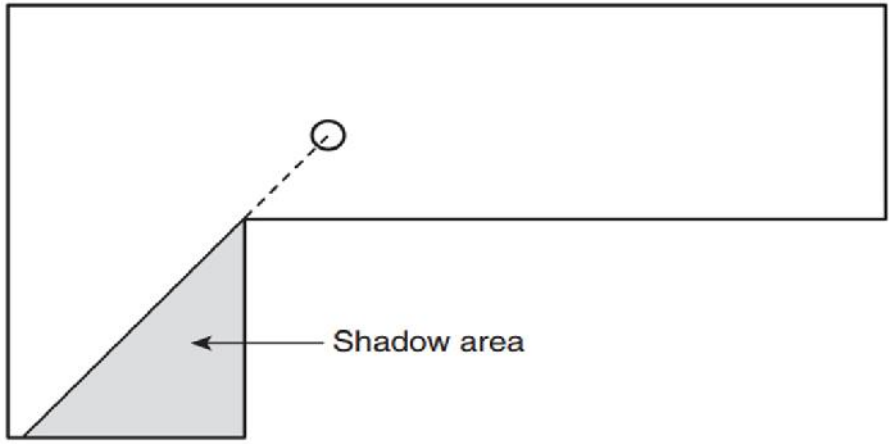

FIGURE A.3.3.9 Shadow Area Created by a Wall.

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History of Residential Sprinkler Systems

NFPA 13D changes explained

- Water is not required on every inch of floor
- Acceptable dry space
- Angled, Winged, Slightly indented, can disrupt
- Within coverage area

Section 8.2.5.7 Shadow areas shall be permitted in the protection area of a sprinkler as long as the cumulative dry areas do not exceed 1.4 sq. meters (15 sq. ft.)

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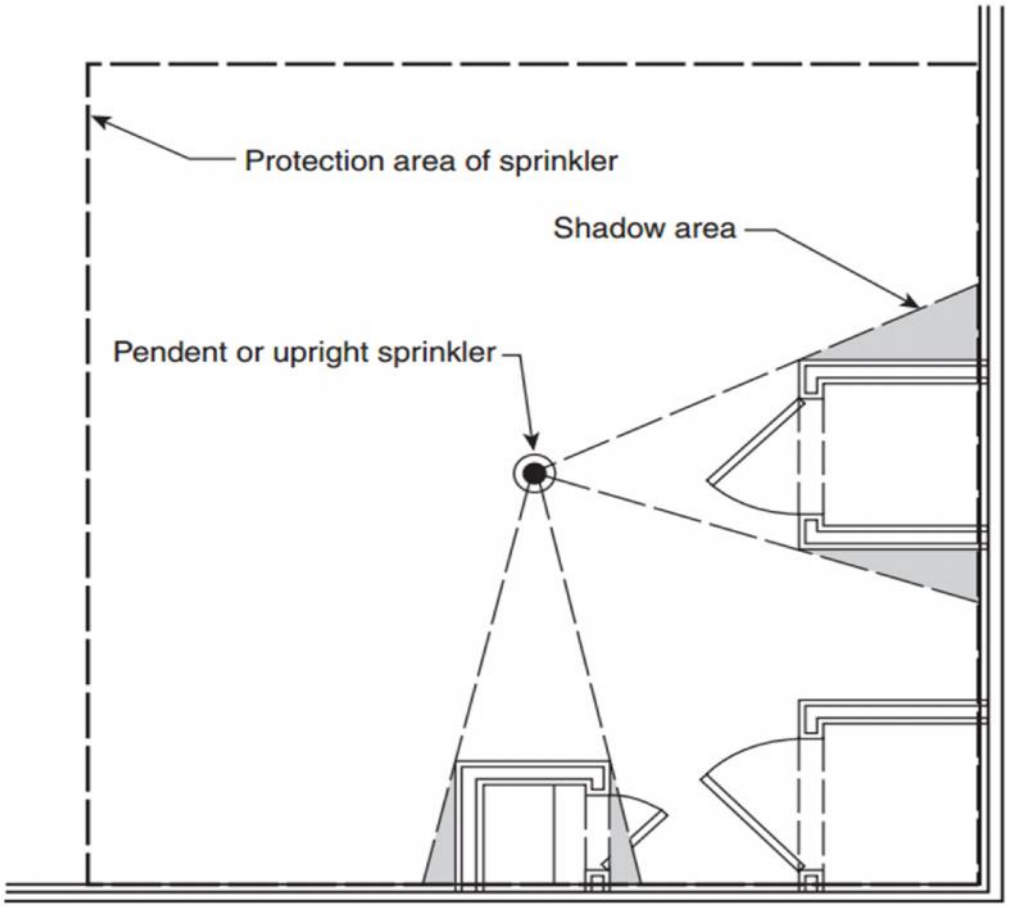
History of Residential Sprinkler Systems

NFPA 13D changes explained



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History of Residential Sprinkler Systems

1989 – The First Edition of NFPA 13R was adopted.

- More conservative than 13D
- Less conservative than NFPA 13

- Hotels
- Motels
- Apartments
- Board and care facilities

- Life safety, similar to NFPA 13D
- Contains same obstruction rules as NFPA 13D

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History of Residential Sprinkler Systems

Significant changes throughout following editions

2007 Edition - New spacing and obstruction rules were added for sloped ceilings, ceiling pockets, ceiling fans, and kitchen cabinets. (Same as covered in NFPA 13D.)

-Regulations were clarified in regards to the use of Quick Response sprinklers.

2010 – Further clarification was added stating that sprinklers are not required on balconies or balcony closets.

2013 Edition - Shadow area criteria was added

- Sloped and beamed criteria was added similar to NFPA 13D
  - 4 sprinkler design instead of 2.

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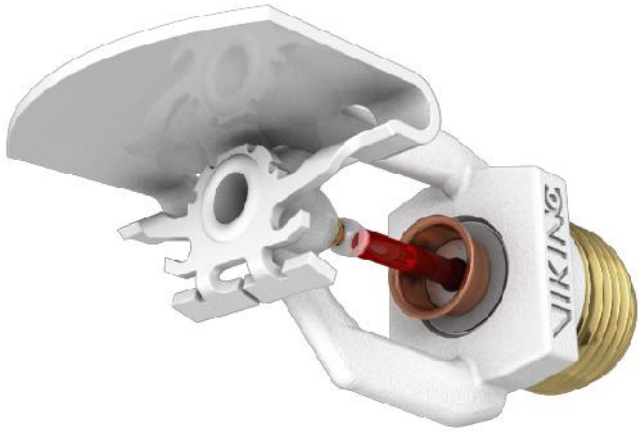
History of Residential Sprinkler Systems

NFPA 13R changes explained

1999 Edition Section 2-5.1.6 The minimum operating pressure of any residential sprinkler shall be 0.5bar (7psi).



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History of Residential Sprinkler Systems

NFPA 13R changes explained

2013 Edition – Shadow Areas

– Dry area cannot exceed 1.4 sq. meters (15 sq. ft.) per sprinkler

- Architectural features - Planters, bay windows, other similar features
- Where no additional floor space is created, no additional sprinkler protection is required

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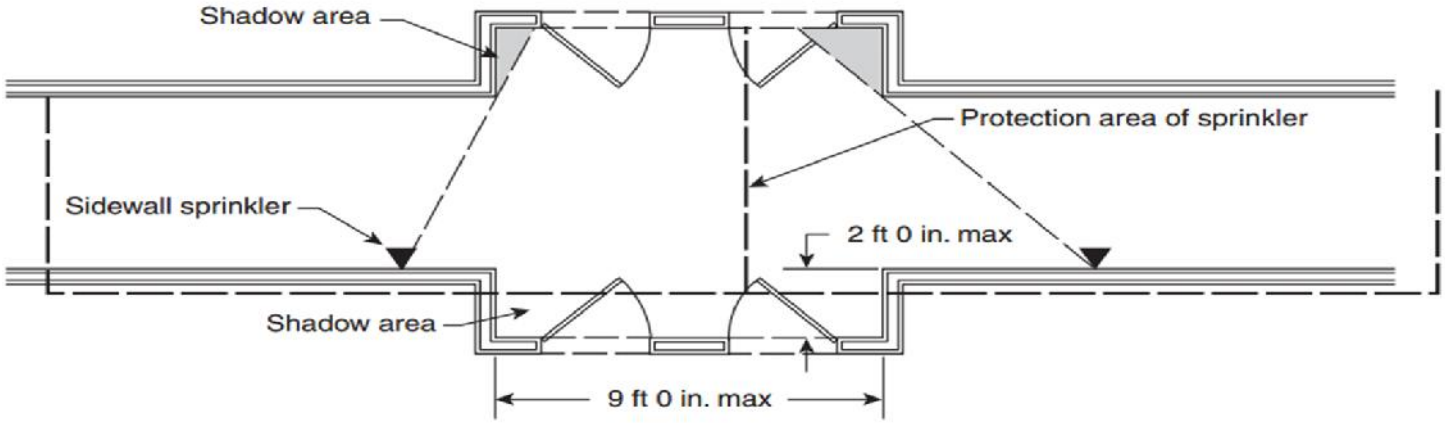
History of Residential Sprinkler Systems

NFPA 13R changes explained

2013 Edition

Where additional floor space is created, evaluate as follows:

- Cannot exceed 1.7 sq. meters (18 sq. ft.)
- Not deeper than 0.61m in depth (2’-0”)
- Not greater than 2.7 meters (9’-0”) in length measured along the primary wall
- Measurement from sprinkler to deepest point shall not exceed the maximum listed spacing



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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion

2013 Edition

- Slope listing section was removed
- Baffle criteria was added for sections Explaining the minimum distance between Sprinklers.
- Distance for Residential sidewall sprinkler deflectors from the wall were added.
- Table for obstructions against walls 457mm (18”) deep or greater was added

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2010

Section 8.10.2.2 states: Where residential sprinklers are installed on a slope greater than 9.5° (2/12), they shall be listed for this application.

NFPA 13 – 2013 – The section above was removed.

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2010

Section 8.10.3.3 - The minimum distance between sprinklers within a compartment shall be 2.44m (8 ft.), unless the listing of the sprinkler requires a greater distance and unless required by 8.10.7.1.5.1 (pendent sprinklers under soffit exceeding 203mm (8”)

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2013

Section 8.10.3.3 - The minimum distance between sprinklers within a compartment shall be 2.44m (8 ft.), unless the listing of the sprinkler requires a greater distance and unless required by 8.10.7.1.5.1 (pendent sprinklers under soffit exceeding 203mm (8”), or unless separated by a baffles that comply with the following:

- Protect the actuating element
- Rigid material that will stay in place during activation
- No less than 203mm (8”) long and 152mm (6”) high.
- Tops to extend between 51mm (2”) and 76mm (3”) above the deflectors of upright sprinklers or even with pendent sprinklers

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2013

Section 8.10.3.4 – Residential sidewall sprinklers shall be permitted to be installed on opposing or adjacent walls, provided no sprinkler is located within the maximum protection area of another sprinkler or unless separated by baffles that comply with the following:

- Protect the actuating element
- Rigid material that will stay in place during activation
- No less than 203mm (8”) long and 152mm (6”) high.
- Tops to extend between 51mm (2”) and 76mm (3”) above the deflectors
- Bottoms to be at least even with deflectors

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2013

Section 8.10.4.4 – Residential sidewall sprinkler deflectors shall be located no more than 152mm (6”) from the wall on which they are mounted unless listed for a grater distance.

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History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2013

457mm (18”) minimum Distance below deflector

610mm (24”) maximum width

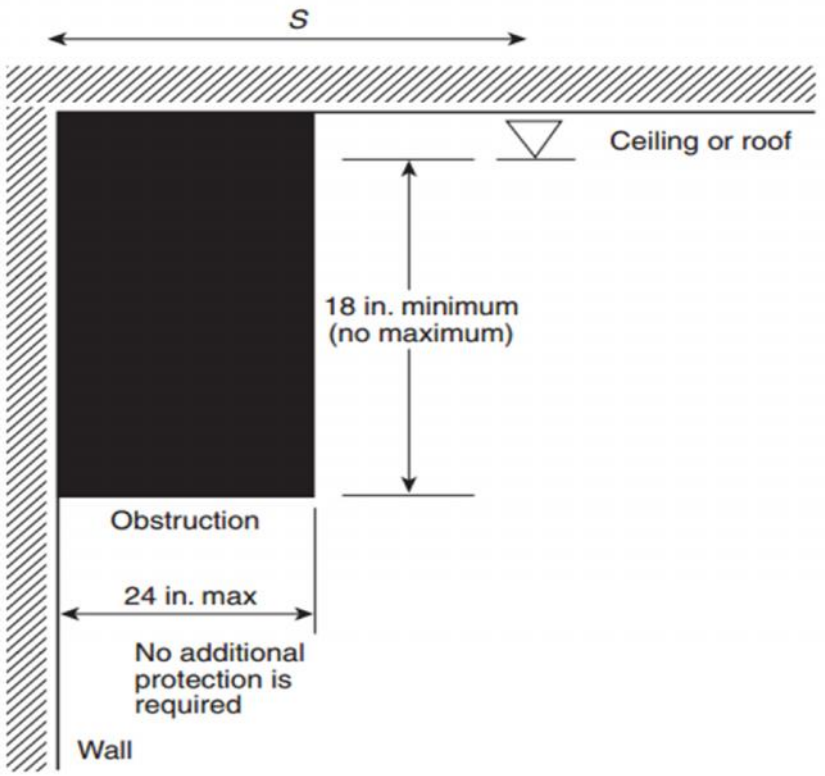


FIGURE 8.10.6.1.2(c) Obstructions Against Wall (Measurements for Residential Upright and Pendent Spray Sprinklers).

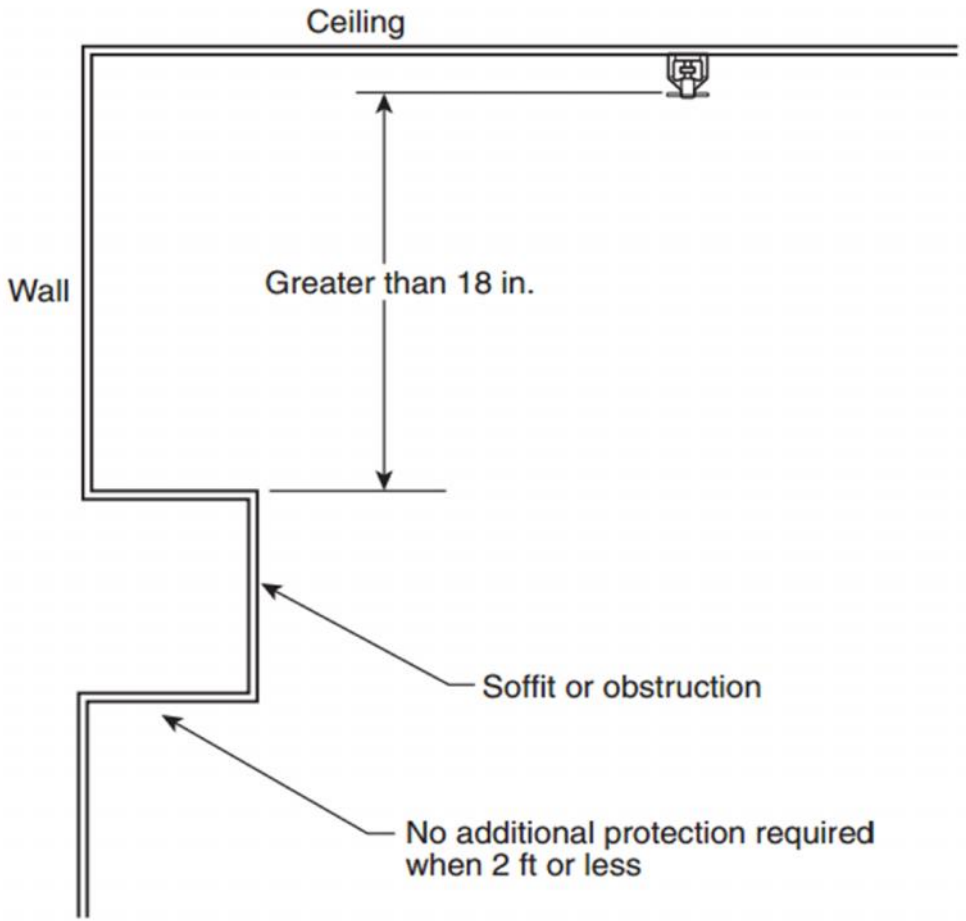
History of Residential Sprinkler Systems

NFPA 13 – Residential Portion changes explained

NFPA 13 -2013

457mm (18”) minimum
Distance below deflector

610mm (24”) maximum
width



Residential Sprinklers

Due to the minimum flow rate requirements for residential sprinklers there are many different K factors for residential sprinklers to address different coverage areas and different code requirements.

Where water flow and pressure are at a premium, smaller K factors with smaller areas of coverage are desired.

Where water and pressure are available, larger coverage Areas will be utilized to reduce the number of sprinklers Installed.

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Residential Sprinklers

Residential Sprinklers are not required to follow the rules for commercial sprinklers.

The K factor of a residential Sprinkler is a function of the amount of water discharge at a given pressure.

Then the K factor is established.

Current residential sprinkler K factors are as such:

43.2 (3.0), 44.7 (3.1), 46.1 (3.2), 57.7 (4.0), 59 (4.1), 60.1 (4.2), 62 (4.3), 63.4 (4.4), 70.6 (4.9), 74.9 (5.2), 79.2 (5.5), 83.5 (5.8), 89.3 (6.2), 106.6 (7.4), 112.3 (7.8)

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Residential Sprinklers

VK470

K = 43.2 (3.0)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Horizontal Ceiling Pressure psi/kPa
12 x 12 (3,7x3,7)	8 (30)	7.1 (49)
14 x 14 (4,3x4,3)	10 (38)	11.1 (77)
16 x 16 (4,9x4,9)	13 (49)	18.8 (129)

VK430

K = 62 (4.3)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Horizontal Ceiling Pressure psi/kPa
12 x 12 (3,7x3,7)	12 (45)	7.8 (54)
14 x 14 (4,3x4,3)	13 (49)	9.1 (63)
16 x 16 (4,9x4,9)	13 (49)	9.1 (63)
18 x 18 (5,5x5,5)	17 (64)	15.6 (108)
20 x 20 (6,1x6,1)	21 (80)	23.9 (164)

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Residential Sprinklers

VK468

K = 70.6 (4.9)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	13 (49)	7.0 (48)
14 x 14 (4,3x4,3)	13 (49)	7.0 (48)
16 x 16 (4,9x4,9)	13 (49)	7.0 (48)
18 x 18 (5,5x5,5)	17 (64)	12.0 (83)
20 x 20 (6,1x6,1)	20 (76)	16.7 (115)

VK466

K = 74.9 (5.2)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	14 (53)	7.2 (50)
14 x 14 (4,3x4,3)	14 (53)	7.2 (50)
16 x 16 (4,9x4,9)	14 (53)	7.2 (50)
18 x 18 (5,5x5,5)	17 (64)	10.7 (74)
20 x 20 (6,1x6,1)	20 (76)	14.8 (102)

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Residential Sprinklers

VK472

K = 83.6 (5.8)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	16 (61)	7.6 (52)
14 x 14 (4,3x4,3)	16 (61)	7.6 (52)
16 x 16 (4,9x4,9)	16 (61)	7.6 (52)
18 x 18 (5,5x5,5)	17 (64)	8.6 (59)
20 x 20 (6,1x6,1)	21 (80)	13.1 (90)

VK458

K = 107 (7.4)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	20 (76)	7.3 (50)
14 x 14 (4,3x4,3)	20 (76)	7.3 (50)
16 x 16 (4,9x4,9)	20 (76)	7.3 (50)
18 x 18 (5,5x5,5)	22 (83)	8.8 (61)
20 x 20 (6,1x6,1)	24 (91)	10.5 (73)

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Residential Sprinklers

VK488

K = 43.2 (3.0)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	8 (30)	7.1 (49)
14 x 14 (4,3x4,3)	11 (42)	13.4 (92)
16 x 16 (6,1x6,1)	13 (49)	18.8 (130)

VK457

K = 70.6 (4.9)

Room Size ft/m	Horizontal Ceiling Flow gpm/lpm	Pressure psi/kPa
12 x 12 (3,7x3,7)	13 (49)	7.0 (48)
14 x 14 (4,3x4,3)	13 (49)	7.0 (48)
16 x 16 (4,9x4,9)	13 (49)	7.0 (48)
18 x 18 (5,5x5,5)	17 (64)	12.0 (83)
20 x 20 (6,1x6,1)	20 (76)	16.7 (115)

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Residential Sprinklers

VK474
K = 83.6 (5.8)

Max. Coverage Area [6] Width X Length Ft. X Ft. (m X m)	Ordinary Temp Rating (165 °F/74 °C)	
	Flow [6] GPM (L/min)	Pressure [6] PSI (bar)
12 X 12 (3.7 X 3.7)	16 (60.6)	7.6 (0.52)
14 X 14 (4.3 X 4.3)	16 (60.6)	7.6 (0.52)
16 X 16 (4.9 X 4.9)	16 (60.6)	7.6 (0.52)
18 X 18 (5.5 X 5.5)	19 (71.9)	10.7 (0.74)
20 X 20 (6.1 X 6.1)	23 (87.1)	15.7 (1.1)

VK468-D
K = 70.6 (4.9)

VK466-D
K = 74.9 (5.2)

VK458-D
K = 107 (7.4)

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Residential Sprinklers

VK486

K = 57.7 (4.0)

Max. Coverage Area [3] Width X Length Ft. X Ft. (m X m)	Max. Spac-ing Ft. (m)	Ordinary Temp Rating (155 °F/68 °C)		Intermediate Temp Rating (175 °F/79 °C)		Top of Deflec-tor to Ceiling
		Flow [3] GPM (L/min)	Pressure [3] PSI (bar)	Flow [3] GPM (L/min)	Pressure [3] PSI (bar)	
12 X 12 (3.7 X 3.7)	12 (3.7)	11 (41.7)	7.6 (0.52)	11 (41.7)	7.6 (0.52)	4 to 6 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	12 (45.5)	9 (0.62)	12 (45.5)	9 (0.62)	
16 X 16 (4.9 X 4.9)	16 (4.9)	13 (49.3)	10.6 (0.73)	13 (49.3)	10.6 (0.73)	
16 X 18 (4.9 X 5.5)	16 (4.9)	16 (60.6)	16 (1.10)	16 (60.6)	16 (1.10)	
16 X 20 (4.9 X 6.1)	16 (4.9)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)	
16 X 22 (4.9 X 6.7)	16 (4.9)	24 (90.8)	36 (2.48)	24 (90.8)	36 (2.48)	
18 X 18 (5.5 X 5.5)	18 (5.5)	18 (68.1)	20.3 (1.40)	19 (71.9)	22.6 (1.60)	
18 X 20 (5.5 X 6.1)	18 (5.5)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)	
20 X 20 (6.1 X 6.1)	20 (6.1)	22 (83.3)	30.3 (2.09)	22 (83.3)	30.3 (2.09)	
12 X 12 (3.7 X 3.7)	12 (3.7)	12 (45.5)	9 (0.62)	12 (45.5)	9 (0.62)	6 to 12 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	12 (45.5)	9 (0.62)	13 (49.3)	10.6 (0.73)	
16 X 16 (4.9 X 4.9)	16 (4.9)	14 (53.0)	12.3 (0.84)	14 (53.0)	12.3 (0.84)	
16 X 18 (4.9 X 5.5)	16 (4.9)	16 (60.6)	16 (1.10)	16 (60.6)	16 (1.10)	
16 X 20 (4.9 X 6.1)	16 (4.9)	23 (87.1)	33.1 (2.28)	23 (87.1)	33.1 (2.28)	
16 X 22 (4.9 X 6.7)	16 (4.9)	26 (98.4)	42.3 (2.91)	26 (98.4)	42.3 (2.91)	
18 X 18 (5.5 X 5.5)	18 (5.5)	18 (68.1)	20.3 (1.40)	19 (71.9)	22.6 (1.60)	
18 X 20 (5.5 X 6.1)	18 (5.5)	23 (87.1)	33.1 (2.28)	23 (87.1)	33.1 (2.28)	
20 X 20 (6.1 X 6.1)	20 (6.1)	24 (90.8)	36 (2.48)	24 (90.8)	36 (2.48)	

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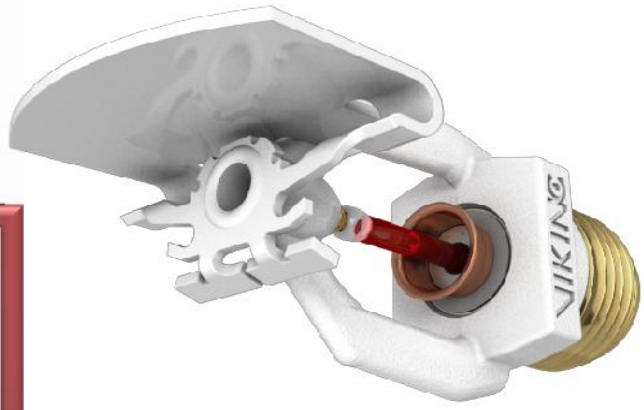
VIKING

Residential Sprinklers

Max. Coverage Area [4] Width X Length Ft. X Ft. (m X m)	Max. Spacing Ft. (m)	Ordinary Temp Rating (155 °F/68 °C)		Intermediate Temp Rating (175 °F/79 °C)		Top of Deflector to Ceiling
		Flow [4] GPM (L/min)	Pressure [4] PSI (bar)	Flow [4] GPM (L/min)	Pressure [4] PSI (bar)	
12 X 12 (3.7 X 3.7)	12 (3.7)	13 (49.2)	9.6 (0.66)	13 (49.2)	9.6 (0.66)	4 to 6 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	14 (53.0)	11.1 (0.77)	15 (56.8)	12.8 (0.88)	
16 X 16 (4.9 X 4.9)	16 (4.9)	16 (60.6)	14.5 (1.00)	17 (64.4)	16.4 (1.13)	
16 X 18 (4.9 X 5.5)	16 (4.9)	19 (71.9)	20.5 (1.41)	19 (71.9)	20.5 (1.41)	
16 X 20 (4.9 X 6.1)	16 (4.9)	22 (83.3)	27.4 (1.89)	22 (83.3)	27.4 (1.89)	
12 X 12 (3.7 X 3.7)	12 (3.7)	14 (53.0)	11.1 (0.77)	14 (53.0)	11.1 (0.77)	6 to 12 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	16 (60.6)	14.5 (1.00)	16 (60.6)	14.5 (1.00)	
16 X 16 (4.9 X 4.9)	16 (4.9)	18 (68.1)	18.4 (1.27)	18 (68.1)	18.4 (1.27)	
16 X 18 (4.9 X 5.5)	16 (4.9)	20 (75.7)	22.7 (1.56)	20 (75.7)	22.7 (1.56)	
16 X 20 (4.9 X 6.1)	16 (4.9)	25 (94.6)	35.4 (2.44)	25 (94.6)	35.4 (2.44)	



VK484

K = 60.5 (4.2)

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Residential Sprinklers

VK460

K = 83.6 (5.8)

Max. Coverage Area [3] Width X Length Ft. X Ft. (m X m)	Max. Spacing Ft. (m)	Ordinary Temp Rating (155 °F/68 °C)		Intermediate Temp Rating (175 °F/79 °C)		Top of Deflector to Ceiling	Installation Type
		Flow [3] GPM (L/min)	Pressure [3] PSI (bar)	Flow [3] GPM (L/min)	Pressure [3] PSI (bar)		
12 X 12 (3.7 X 3.7)	12 (3.7)	16 (60.6)	7.6 (0.52)	16 (60.6)	7.6 (0.52)	4 to 6 inches	Standard surface-mounted escutcheons or the Microfast® Model F-1 Adjustable Escutcheon, **or** recessed with the Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon, or G-1 Adjustable Escutcheon
14 X 14 (4.3 X 4.3)	14 (4.3)	16 (60.6)	7.6 (0.52)	16 (60.6)	7.6 (0.52)		
16 X 16 (4.9 X 4.9)	16 (4.9)	20 (75.7)	11.9 (0.82)	21 (79.5)	13.1 (0.90)		
16 X 18 (4.9 X 5.5)	16 (4.9)	22 (83.3)	14.4 (0.99)	22 (83.3)	14.4 (0.99)		
16 X 20 (4.9 X 6.1)	16 (4.9)	26 (98.4)	20.1 (1.39)	26 (98.4)	20.1 (1.39)		
16 X 22 (4.9 X 6.7)	16 (4.9)	31 (117.3)	28.6 (1.97)	--	--		
18 X 18 (5.5 X 5.5)	18 (5.5)	23 (87.1)	15.7 (1.1)	23 (87.1)	15.7 (1.1)		
18 X 20 (5.5 X 6.1)	18 (5.5)	29 (109.8)	25.0 (1.7)	29 (109.8)	25.0 (1.7)		
20 X 20 (6.1 X 6.1)	20 (6.1)	30 (113.6)	26.8 (1.8)	30 (113.6)	26.8 (1.8)		
16 X 24 (4.9 X 7.3)	16 (4.9)	38 (143.8)	42.9 (2.96)	--	--		
14 X 26 (4.3 X 7.9)	14 (4.3)	42 (159)	52.4 (3.62)	--	--		Standard surface-mounted escutcheons only
12 X 12 (3.7 X 3.7)	12 (3.7)	16 (60.6)	7.6 (0.52)	16 (60.6)	7.6 (0.52)	6 to 12 inches	escutcheons or the Microfast® Model F-1 Adjustable Escutcheon, **or** recessed with the Micromatic® Model E-1, E-2, or E-3 Recessed Escutcheon, or G-1 Adjustable Escutcheon
14 X 14 (4.3 X 4.3)	14 (4.3)	18 (68.1)	9.7 (0.67)	18 (68.1)	9.7 (0.67)		
16 X 16 (4.9 X 4.9)	16 (4.9)	24 (90.8)	17.1 (1.2)	24 (90.8)	17.1 (1.2)		
16 X 18 (4.9 X 5.5)	16 (4.9)	27 (102.2)	21.7 (1.49)	27 (102.2)	21.7 (1.49)		
16 X 20 (4.9 X 6.1)	16 (4.9)	32 (121.1)	30.4 (2.1)	32 (121.1)	30.4 (2.1)		
16 X 22 (4.9 X 6.7)	16 (4.9)	37 (140.1)	40.7 (2.81)	--	--		
18 X 18 (5.5 X 5.5)	18 (5.5)	29 (109.8)	25.0 (1.7)	29 (109.8)	25.0 (1.7)		
18 X 20 (5.5 X 6.1)	18 (5.5)	35 (132.5)	36.4 (2.51)	35 (132.5)	36.4 (2.51)		
20 X 20 (6.1 X 6.1)	20 (6.1)	36 (136.3)	38.5 (2.66)	36 (136.3)	38.5 (2.66)		
16 X 24 (4.9 X 7.3)	16 (4.9)	42 (159)	52.4 (3.62)	--	--		
14 X 26 (4.3 X 7.9)	14 (4.3)	46 (174.1)	62.9 (4.34)	--	--		Standard surface-mounted escutcheons only

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Residential Sprinklers

VK480

K = 57.7 (4.0)

Sprinkler Base Part Number [1]		SIN	NPT Thread Size	
			Inches	mm
16116AC		VK480	1/2	15
Max. Coverage Area [6] Width X Length Ft. X Ft. (m X m)	Max. Spacing Ft. (m)	Ordinary Temp Rating (165 °F/74 °C)		Centerline of Sprinkler to Ceiling
		Flow [6] GPM (L/min)	Pressure [6] PSI (bar)	
12 X 12 (3.7 X 3.7)	12 (3.7)	11 (41.7)	7.6 (0.52)	4-3/8 to 6-3/8 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	13 (49.3)	10.6 (0.73)	
16 X 16 (4.9 X 4.9)	16 (4.9)	16 (60.6)	16 (1.10)	
16 X 18 (4.9 X 5.5)	16 (4.9)	17 (64.4)	18.1 (1.25)	
12 X 12 (3.7 X 3.7)	12 (3.7)	12 (45.5)	9 (0.62)	6-3/8 to 12-3/8 inches
14 X 14 (4.3 X 4.3)	14 (4.3)	14 (53.0)	12.3 (0.84)	
16 X 16 (4.9 X 4.9)	16 (4.9)	16 (60.6)	16 (1.10)	
16 X 18 (4.9 X 5.5)	16 (4.9)	18 (68.1)	20.3 (1.40)	

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VK467 – Freedom® Residential Upright Sprinkler

The first and only residential upright sprinkler

- Intended for industrial spaces converted into residential loft-type construction
  - Mill-type construction (heavy timber)
- Installed exposed, on black steel pipe
- 71 (4.9) K factor
- 68°C (155°F) and 79°C (175°F)
- temperature ratings
- cULus Listed

- ***ALSO AVAILABLE IN NEW ENT COATING FOR CORROSION RESISTANCE***

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VK467 – Freedom® Residential Upright Sprinkler

The first and only residential upright sprinkler

- Provides residential design advantage in NFPA 13R and NFPA 13 application
  - NFPA 13R, allows for use of 2.04mm/min (0.05 GPM/ft2) density, compared to 4.1mm/min (0.1 GPM ft/2) if a commercial sprinkler is used
- In NFPA 13 residential systems over four stories, a four head residential design can be used, compared to 83 sq. meters (900 sq. ft.) to 139 sq. meters (1,500 sq. ft.) design area when using commercial sprinklers
  - Use a 4.1mm/min (0.10 GPM per sq. ft.) density for the spacing of the sprinkler or the UL Listed flow rate, which ever is greater (per NFPA 13)

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VK467 – Freedom® Residential Upright Sprinkler

The first and only residential upright sprinkler

- Residential upright sprinklers address some of the installation challenges for industrial “loft type” residential sprinkler installations.

- Although pendent residential sprinklers can be used, deflectors must be located within 28.5mm (1-1/8”) and 44.5mm (1-3/4”) below the beam, requiring an offset or return bend from the sprinkler line.

- The VK467 upright residential sprinkler can be installed onto steel sprinkler piping without offsets. (refer to UL Listing data on following slides)

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VK467 – Freedom® Residential Upright Sprinkler

The first and only residential upright sprinkler

- Beamed Ceiling Listings
  - Minimum distance apart: 2.74m (9’-0”)
  - Maximum distance apart: 4.9m (16’-0”)
  - Maximum beam depth: 356mm (14”)
  - Maximum distance below beam: 76mm (3”)
  - Maximum beam length: 6.1m (20’-0”)
- **When primary beam spans exceed 6.1m (20 ft), an alternative to installing baffles is to design for all heads in the compartment**
  - **See example on following page**
- Maximum distance between beams: 6.1m (20’-0”)

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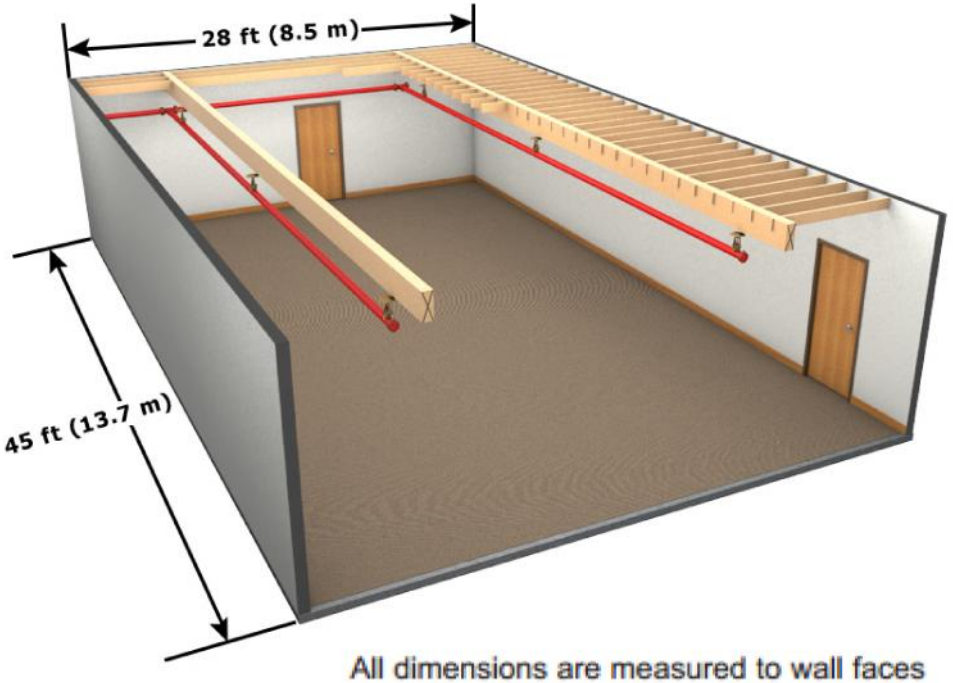
VK467 – Freedom® Residential Upright Sprinkler

Alternate design approach when primary beams exceed 6.1m (20 ft)

- In this example, all six sprinklers could be calculated in lieu of installing baffles
- In many loft-type structures, water supplies are sufficient to allow for this alternative design approach
- Why would this approach be better than 5 head design @ 4.1mm/min (0.1 GPM/ft2) density using commercial sprinklers?
  - 139 sq. meters (1,500 sq ft) … but never fewer than five sprinklers in design area
  - This may require more than a 5 head design to pick up the entire 139 sq. meters (1,500 sq ft)
    - QR reduction not always possible
  - Also, AHJ preference to use a residential sprinkler in a residential occupancy



All dimensions are measured to wall faces and to centerlines of beams.

- Primary beam spans exceeding 20 ft (6.1 m)
- Secondary beams or baffles not required
- Calculate all sprinklers in compartment (Above example 6 sprinklers)

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VK467 – Freedom® Residential Upright Sprinkler

Positioning Under Beams

Figure 3: Sprinkler Positioning Under Primary Beams

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VK467 – Freedom® Residential Upright Sprinkler

Positioning Under Beams

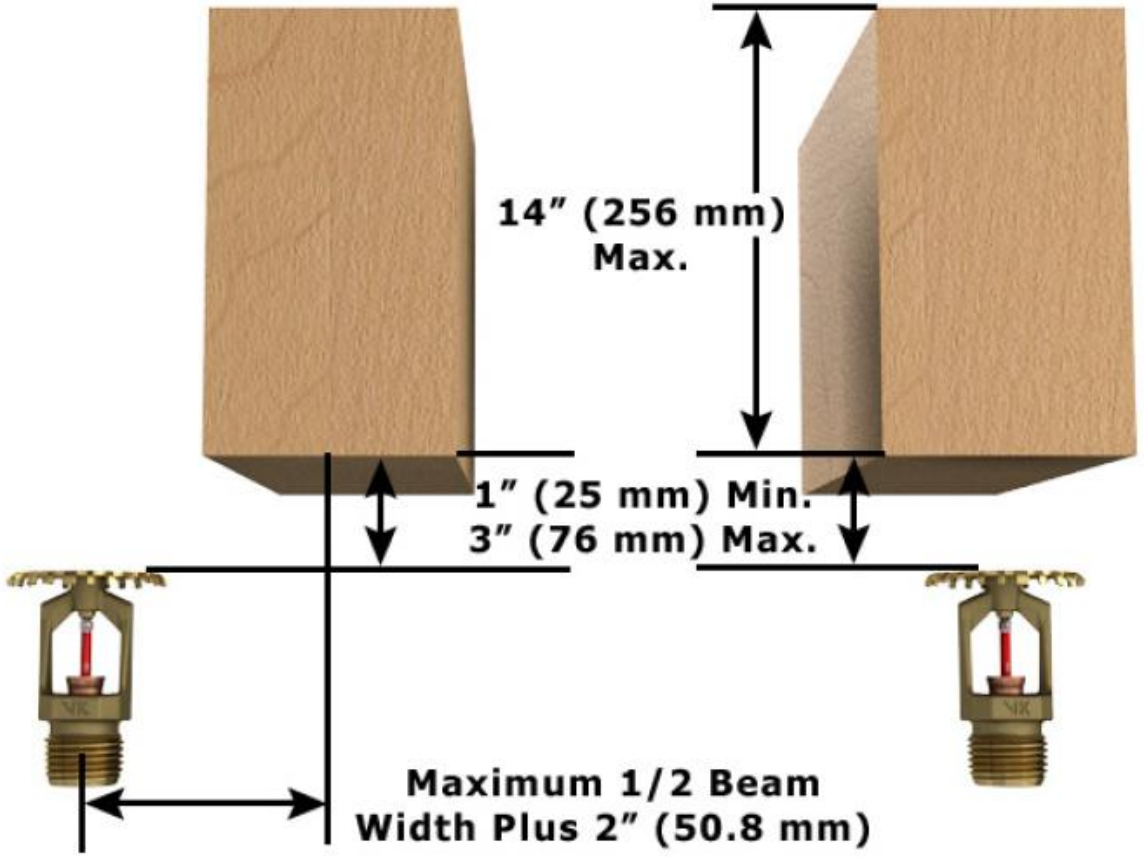

Figure 2: Sprinkler Positioning Under Primary Beams

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TECHNICAL DATA

FREEDOM® RESIDENTIAL CONCEALED PENDENT SPRINKLER VK457 (K4.9)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

Viking Freedom® Residential Concealed Pendent Sprinkler VK457 is a small high-sensitivity solder link and lever residential sprinkler designed for installation on concealed pipe systems where the appearance of a smooth ceiling is desired. The orifice design, with a K-Factor of 4.9 (70.6 metric*), allows the sprinkler's efficient use of available water supplies for the hydraulically designed fire-protection system. The operating element and special deflector characteristics meet the challenges of residential sprinkler standards.

The sprinkler is pre-assembled with a threaded adapter for installation with a low-profile small-diameter cover assembly installed flush to the ceiling. The two-piece design allows installation and testing of the sprinkler prior to installation of the cover plate. The "push-on", "thread-off" design of the concealed cover plate assembly allows easy installation of the cover plate after the system has been tested and the ceiling finish has been applied, while also providing up to ½" (12.7 mm) of vertical adjustment. The cover assembly can be removed and reinstalled, allowing temporary removal of ceiling panels without taking the sprinkler system out of service or removing the sprinkler. The Electroless Nickel PTFE (ENT) coating has been investigated for installation in corrosive atmospheres and is C-UL-US-EU Listed as corrosion resistant as indicated in the Approval Charts. The ENT finish is only available for the sprinkler assembly, the cover plate is not plated.

2. LISTINGS AND APPROVALS

c UL us EU **UL Listed (C-UL-US-EU):** Category VKKW
Refer to the Approval Charts and Design Criteria on for C-UL-US-EU Listing requirements that must be followed.

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3. TECHNICAL DATA

Specifications:

Available since 2008.
Minimum Operating Pressure: Refer to the Approval Chart.
Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).
Thread size: 1/2" (15 mm) NPT
Nominal K-Factor: 4.9 U.S. (70.6 metric*)

* Metric K-factor measurement shown is in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

Material Standards:

Sprinkler Body: Brass UNS-C84400 or QM Brass
Deflector: Phosphor Bronze UNS-C51000
Deflector Pins: Stainless Steel UNS-S30200
Button: Brass UNS-C36000
Seat Assembly: Brass UNS-C31600
Compression Screw: Brass UNS-C36000
Fusible Element Assembly: Beryllium Nickel, coated with black acrylic paint
Levers: Stainless Steel UNS-S31600
Lever Bar: Copper Alloy UNS-C72500
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
Cover Adapter: Cold Rolled Steel UNS-G10080, Finish: Clear Chromate over Zinc Plating
Shipping Cap: Polyethylene

Cover Plate Materials:

Cover Plate Assembly: Copper UNS-C11000 and Brass UNS-C26800
Spring: Beryllium Nickel
Solder: Eutectic

Viking Technical Data may be found on The Viking Corporation's Web site at http://www.vikinggroupinc.com. The Web site may include a more recent edition of this Technical Data Page.

Viking Residential Technical Data Sheets

Ordering Information: (Also refer to the current Viking price list.)
Viking Freedom® Residential Concealed Pendent Sprinkler VK457 and Cover Plate Assembly must be ordered separately:
Sprinkler: Part No. 14694AC for Brass finish and 14694JNC for ENT finish (includes a 165°F (74°C) rated sprinkler with a protective plastic cap covering the unit).
Cover Plate Assembly: Base Part No. 13504 (2-3/4" diameter), Base Part No. 13642 (3-5/16" diameter), or Base Part No. 15394 (square cover plate, 3-5/16" diameter)

Specify finish and temperature rating of the cover plate assembly by adding the appropriate suffixes for the finish and the cover temperature rating to the base part number:
Finish Suffix: Polished Chrome = F, Brushed Chrome = F-/B, Bright Brass = B, Antique Brass = B-/A, Brushed Brass = B-/B, Brushed Copper = E-/B, Painted White = M-/W, Painted Ivory = M-/I, Painted Black = M-/B
Temperature Suffix: 135 °F/57 °C = A
For example, cover 13504 with a Polished Chrome finish and a 135 °F/57 °C temperature rating = 13504FA.
Available Finishes And Temperature Ratings: Refer to Table 1.
Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking data book.)
Sprinkler Wrenches**:
A. Heavy Duty Part No. 13623W/B (available since 2006), or
B. Head Cabinet Wrench Part No. 13619*** (available since 2006)
C. Optional Concealed Cover Plate Installer Tool Part No. 14412 (available since 2007)
D. Optional Large Concealed Cover Plate Installer Tool Part No. 14867 (available since 2007)
**Requires a ½" ratchet (not available from Viking). ***Also optional for removal of the protective cap. Ideal for sprinkler cabinets.
Sprinkler Cabinet: Part No. 01731A (available since 1971)

Viking Residential Technical Data Sheets

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating[1]	Maximum Ambient Ceiling Temperature[2]	Temperature Rating of the Cover Assembly (Required)	Cover Plate Base Part Number[3]	Large Cover Plate Base Part Number[3]	Square Cover Plate Base Part Number[3]
Ordinary	165 °F (74 °C)	100 °F (38 °C)	135 °F (57 °C)	13504	13642	15394

Sprinkler Finishes: Brass and ENT

Cover Plate Finishes: Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black

Corrosion Resistant Coatings[4]: ENT

Footnotes

[1] The sprinkler temperature rating is stamped on the deflector.

[2] Based on NFPA-13, NFPA 13R, and NFPA 13D. Other limits may apply, depending on fire loading, sprinkler location, and other requirements of the Authority Having Jurisdiction. Refer to specific installation standards.

[3] Part number shown is the base part number. For complete part number, refer to current Viking price list schedule.

[4] The corrosion resistant coatings have passed the standard corrosion test required by the approving agencies indicated in the Approval Charts. These tests cannot and do not represent all possible corrosive environments. Prior to installation, verify through the end-user that the coatings are compatible with or suitable for the proposed environment. For automatic sprinklers, the ENT coating is applied to all exposed exterior surfaces, including the waterway. For ENT coated sprinklers, the Belleville spring is exposed.

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Approval Chart 2
Viking VK457, 4.9 K-Factor Residential Concealed Pendent Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number [1]	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure			
		Inches	mm	U.S.	metric [2]				
14694JNC	VK457	1/2	15	4.9	70.6	175 psi (12 bar)			
Max. Coverage Area [5] Width X Length Ft. X Ft. (m X m)	Ordinary Temp Rating (165 °F/74 °C)		Deflector to Ceiling	Installation Type	Listings and Approvals[3]			Minimum Spacing Ft. (m)	
	Flow [5] GPM (L/min)	Pressure [5] PSI (bar)			C-UL-US-EU [4]	NYC	NSF		
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)	Refer to Figure 2	Concealed with Cover Plate Assembly	See Foot-notes 6, 8, and 9	--	--	8 (2.4)	
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)							
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)							
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)							
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)							

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Approval Chart 2
Viking VK457, 4.9 K-Factor Residential Concealed Pendent Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number [1]	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure			
		Inches	mm	U.S.	metric [2]				
14694JNC	VK457	1/2	15	4.9	70.6	175 psi (12 bar)			
Max. Coverage Area [5] Width X Length Ft. X Ft. (m X m)	**Ordinary Temp Rating (165 °F/74 °C)**		**Deflector to Ceiling**	**Installation Type**	**Listings and Approvals[3]**			**Minimum Spacing Ft. (m)**	
	Flow [5] GPM (L/min)	**Pressure [5] PSI (bar)**			**C-UL-US-EU [4]**	**NYC**	**NSF**		
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)	Refer to Figure 2	Concealed with Cover Plate Assembly	See Foot-notes 6, 8, and 9	--	--	8 (2.4)	
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)							
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)							
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)							
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)							

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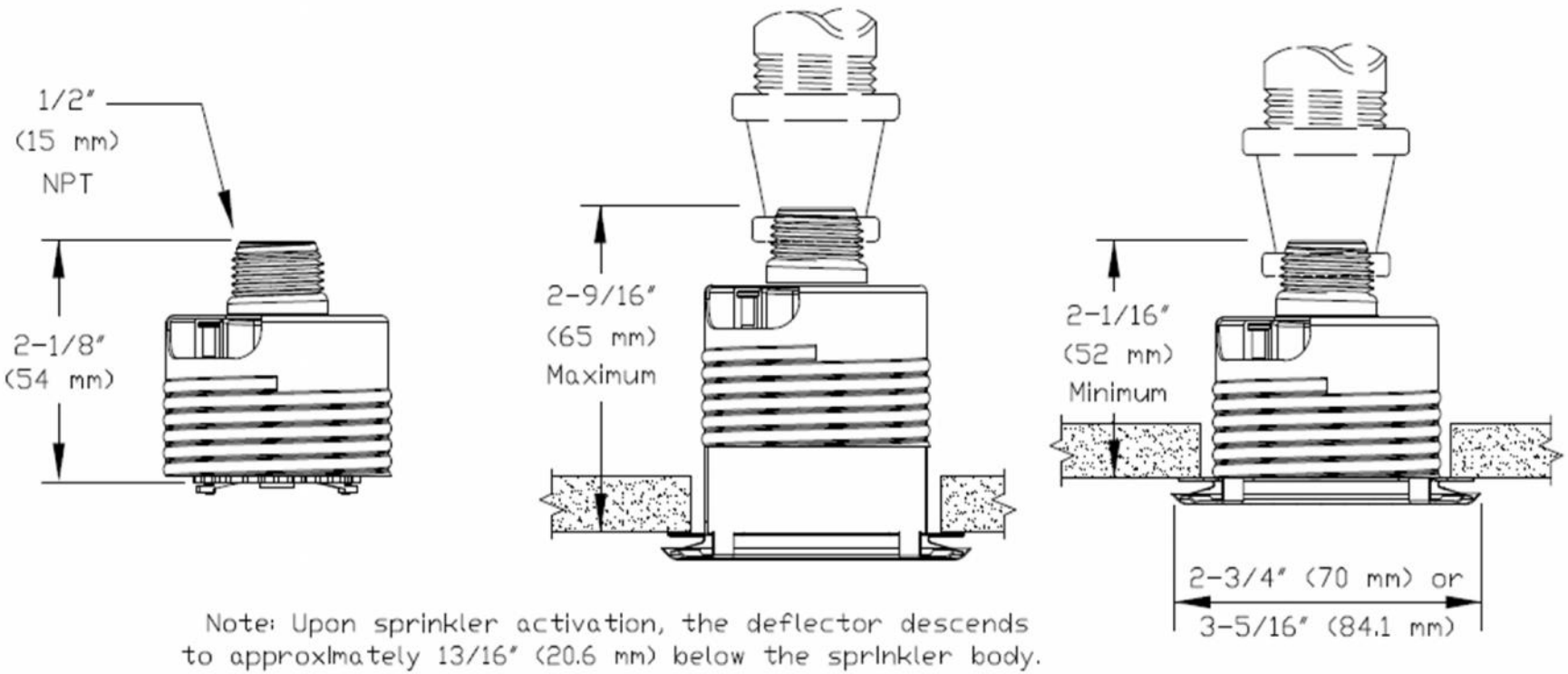

Note: Upon sprinkler activation, the deflector descends to approximately 13/16" (20.6 mm) below the sprinkler body.

Figure 2: Sprinkler Dimensions and Cover Installation

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Approval Chart 2
Viking VK457, 4.9 K-Factor Residential Concealed Pendent Sprinkler

For systems designed to NFPA 13D or NFPA 13R. For systems designed to NFPA 13, refer to the design criteria. For Ceiling types refer to NFPA 13, 13R or 13D 2013 Editions

Sprinkler Base Part Number [1]	SIN	NPT Thread Size		Nominal K-Factor		Maximum Water Working Pressure			
		Inches	mm	U.S.	metric [2]				
14694JNC	VK457	1/2	15	4.9	70.6	175 psi (12 bar)			
Max. Coverage Area [5] Width X Length Ft. X Ft. (m X m)	**Ordinary Temp Rating (165 °F/74 °C)**		**Deflector to Ceiling**	**Installation Type**	**Listings and Approvals[3]**			**Minimum Spacing Ft. (m)**	
	Flow [5] GPM (L/min)	**Pressure [5] PSI (bar)**			**C-UL-US-EU [4]**	**NYC**	**NSF**		
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)	Refer to Figure 2	Concealed with Cover Plate Assembly	See Foot-notes 6, 8, and 9	--	--	8 (2.4)	
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)							
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)							
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)							
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)							

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Footnotes

[1] Part number shown is the base part number. For complete part number, refer to current Viking price schedule.

[2] Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

[3] This chart shows the listings and approvals available at the time of printing. Other approvals may be in process. Check with the manufacturer for any additional approvals. Refer also to Design Criteria.

[4] Listed by Underwriter's Laboratories, Inc. for use in the U.S. and Canada.

[5] For areas of coverage smaller than shown, use the "Flow" and "Pressure" for the next larger area listed. Flows and pressures listed are per sprinkler. The distance from sprinklers to walls shall not exceed one-half the sprinkler spacing indicated for the minimum "Flow" and "Pressure" used.

[6] Cover Temperature Rating is 135 °F (57 °C). Cover Part No. 13504[1], 13642[1] (large diameter), or 15394[1] (square cover plate).

[7] Other paint colors are available on request with the same listings as the standard finish colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information. Custom colors are indicated on a label inside the cover assembly. Refer to Figure 3.

[8] Accepted Cover Plate Finishes are: Polished Chrome, Brushed Chrome, Bright Brass, Antique Brass, Brushed Brass, Brushed Copper, Painted White, Painted Ivory, or Painted Black [7].

[9] C-UL-US-EU Listed as corrosion resistant.

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Max. Coverage Area [5] Width X Length Ft. X Ft. (m X m)	Ordinary Temp Rating (165 °F/74 °C)	
	Flow [5] GPM (L/min)	Pressure [5] PSI (bar)
12 X 12 (3.7 X 3.7)	13 (49.2)	7.0 (0.48)
14 X 14 (4.3 X 4.3)	13 (49.2)	7.0 (0.48)
16 X 16 (4.9 X 4.9)	13 (49.2)	7.0 (0.48)
18 X 18 (5.5 X 5.5)	17 (64.4)	12.0 (0.83)
20 X 20 (6.1 X 6.1)	20 (75.7)	16.7 (1.15)

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Footnotes

[1] Part number shown is the base part number. For complete part number, refer to current Viking price schedule.

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[6] Cover Temperature Rating is 135 °F (57 °C). Cover Part No. 13504[1], 13642[1] (large diameter), or 15394[1] (square cover plate).

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[1] Part number shown is the base part number. For complete part number, refer to current Viking price schedule.

[2] Metric K-factor measurement shown is when pressure is measured in Bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.

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[6] Cover Temperature Rating is 135 °F (57 °C). Cover Part No. 13504[1], 13642[1] (large diameter), or 15394[1] (square cover plate).

[7] Other paint colors are available on request with the same listings as the standard finish colors. Listings and approvals apply for any paint manufacturer. Contact Viking for additional information. Custom colors are indicated on a label inside the cover assembly. Refer to Figure 3.

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[9] C-UL-US-EU Listed as corrosion resistant.

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DESIGN CRITERIA

(Also refer to the Approval Chart on page 147w.)

cULus Listing Requirements:

When using Viking Residential Concealed Pendent Sprinkler VK457 for systems designed to NFPA 13D or NFPA 13R, apply the listed areas of coverage and minimum water supply requirements shown in the Approval Charts on pages 147w and 147x.

For systems designed to NFPA 13: The number of design sprinklers is to be the four contiguous most hydraulically demanding sprinklers. The minimum required discharge from each of the four sprinklers is to be the greater of the following:

- The flow rates given in the Approval Charts on data pages 147w and 147x for NFPA 13D and NFPA 13R applications for each listed area of coverage, **or**
- Calculated based on a minimum discharge of 0.1 gpm/sq. ft. over the "design area" in accordance with sections 8.5.2.1 or 8.6.2.1.2 of NFPA 13.
- Minimum distance between residential sprinklers: 8 ft. (2.4 m).

NOTE: Concealed sprinklers must be installed in neutral or negative pressure plenums only.

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(1) VK457 protecting a 6m x 5m Living Room

- Approval Chart – 6.1m x 6.1m

- Requires – 75.7 lpm @ 1.15 bar
- Based on 2.04/mm/min

- NFPA 13 - 4.08mm/min

- Use actual coverage area

- 6m * 5m = 30m

- 30m * 4.08 density = 123 lpm

- $(Q / K^2) = P$

Viking Residential Technical Data Sheets

(1) VK457 protecting a 6m x 5m Living Room

- Q = 123lpm
- K = 70.6
- (123/70.6) = 3.1 bar

Approval Chart[2]
75.7 lpm @ 1.15 bar

Actual Area at 4.08mm/min
123lpm @ 3.1 bar

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(1) VK457 protecting a 5.6m x 3m Sun Room

- Approval Chart – 6.1m x 6.1m

- Requires – 75.7 lpm @ 1.15 bar

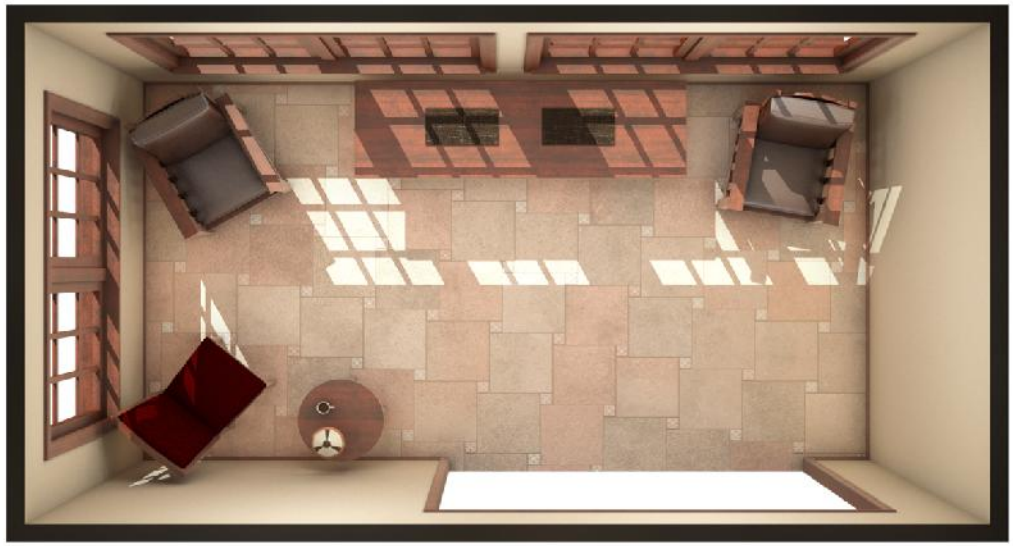
- NFPA 13 - 4.08mm/min density

- Use actual coverage area

- 5.6m * 3m = 16.8m

- 16.8m ^{2} * 4.08 density = 69 lpm

- $(Q/K)^2 = P$



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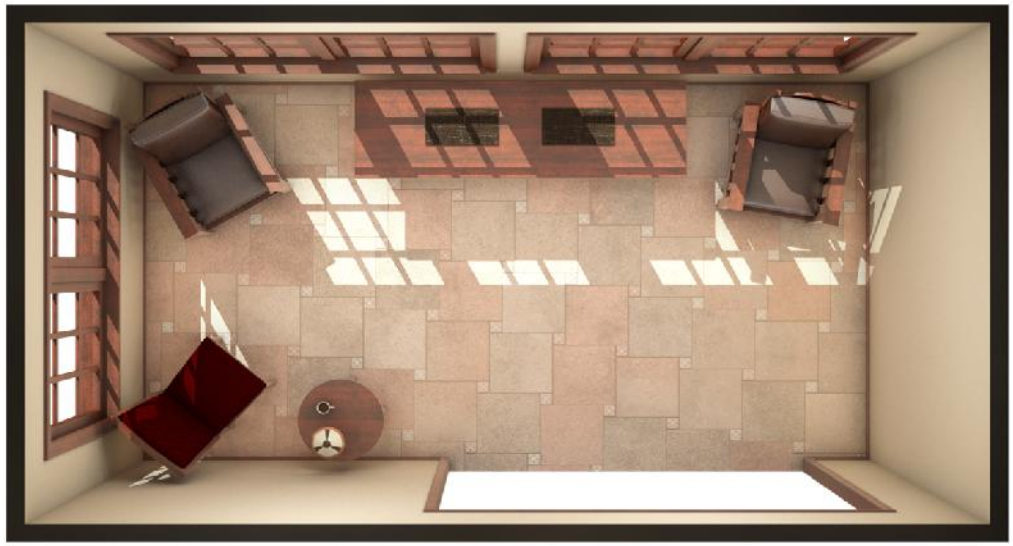
(1) VK457 protecting a 5.6m x 3m Sun Room

- Q = 69 lpm
- K = 70.6

- $(69/70.6)^2$ = .96 bar

Approval Chart
75.7 lpm @ 1.15 bar

Actual Area at 4.08 mm/min
69lpm @ .96 bar



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NFPA 13D Design and Calculations

NFPA 13D Design

NFPA 13D – One and Two Family Dwellings and Manufactured Homes

NFPA 13D – Up to (2) head design Listed Flows and Pressures

- 7 or 10 minute water supply

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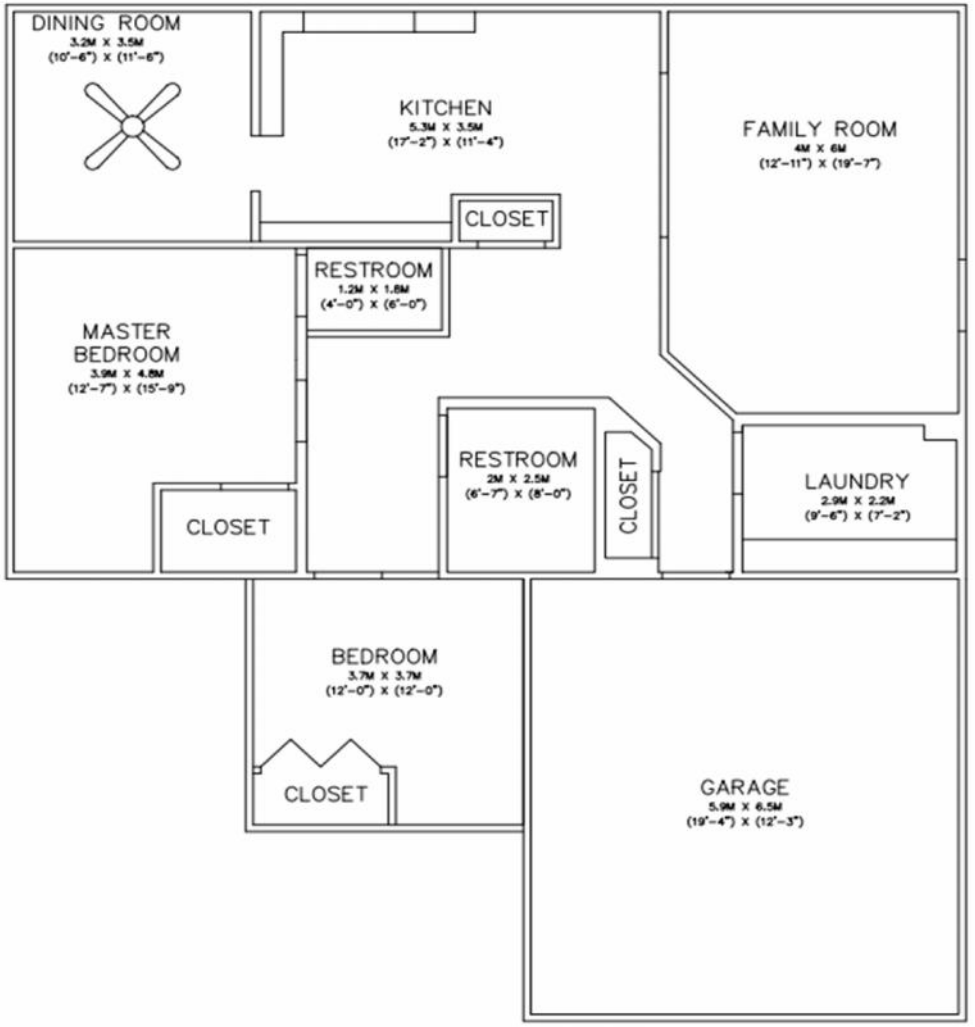
NFPA 13D Design and Calculations

NFPA 13D Design

1) Determine if NFPA 13D is the applicable standard.

Q) Is this a one or two family dwelling?



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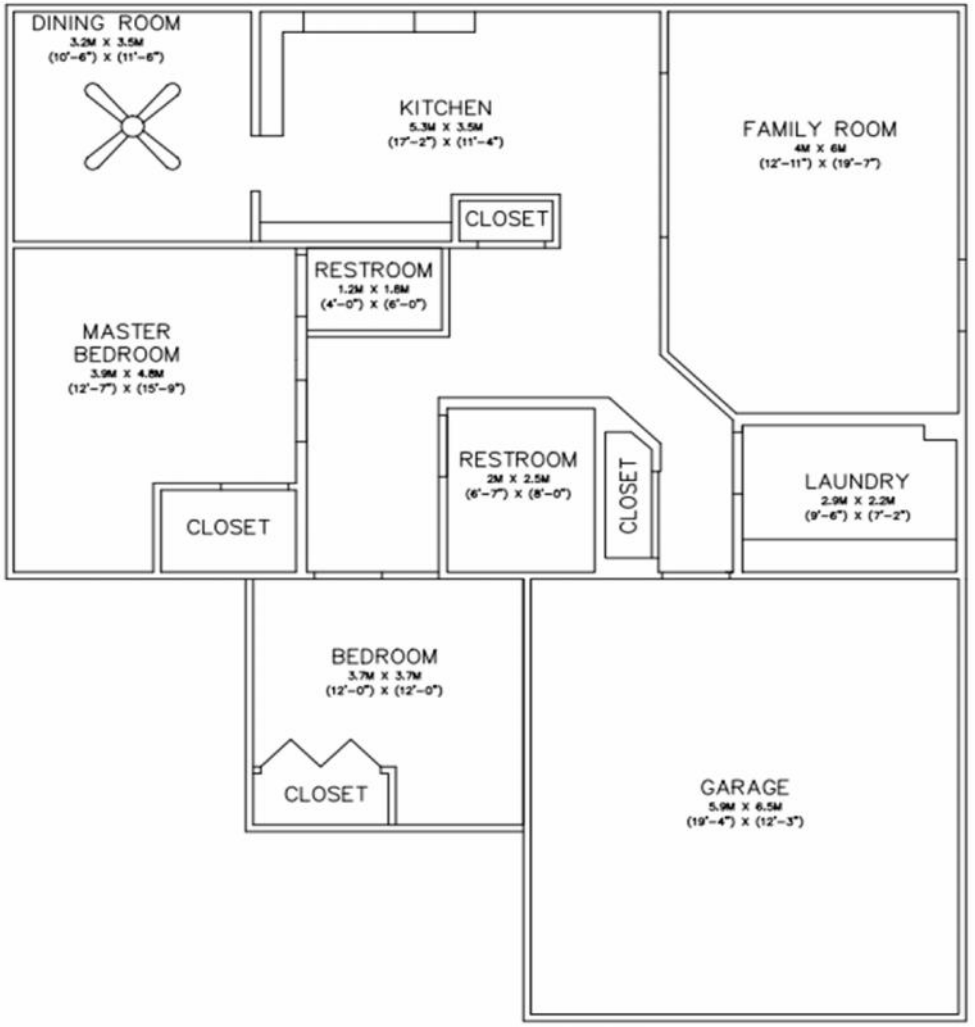
NFPA 13D Design and Calculations

NFPA 13D Design

1) Determine if NFPA 13D is the applicable standard.

Q) Is this a one or two family dwelling?

A) YES



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NFPA 13D Design and Calculations

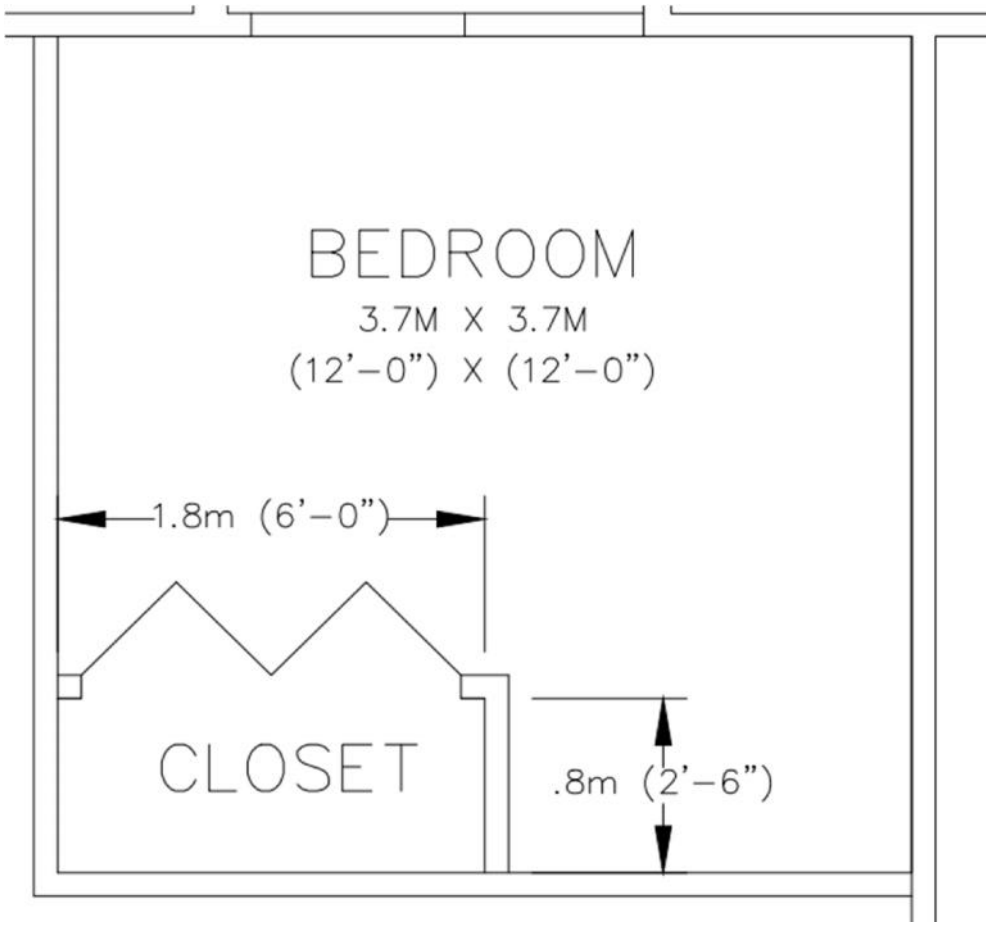
NFPA 13D Design

5) Which areas require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets
- Area does not exceed 2.2 sq. meters
- Shortest dimension does not exceed .9m
- Non or limited combustible finish



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NFPA 13D Design and Calculations

NFPA 13D Design

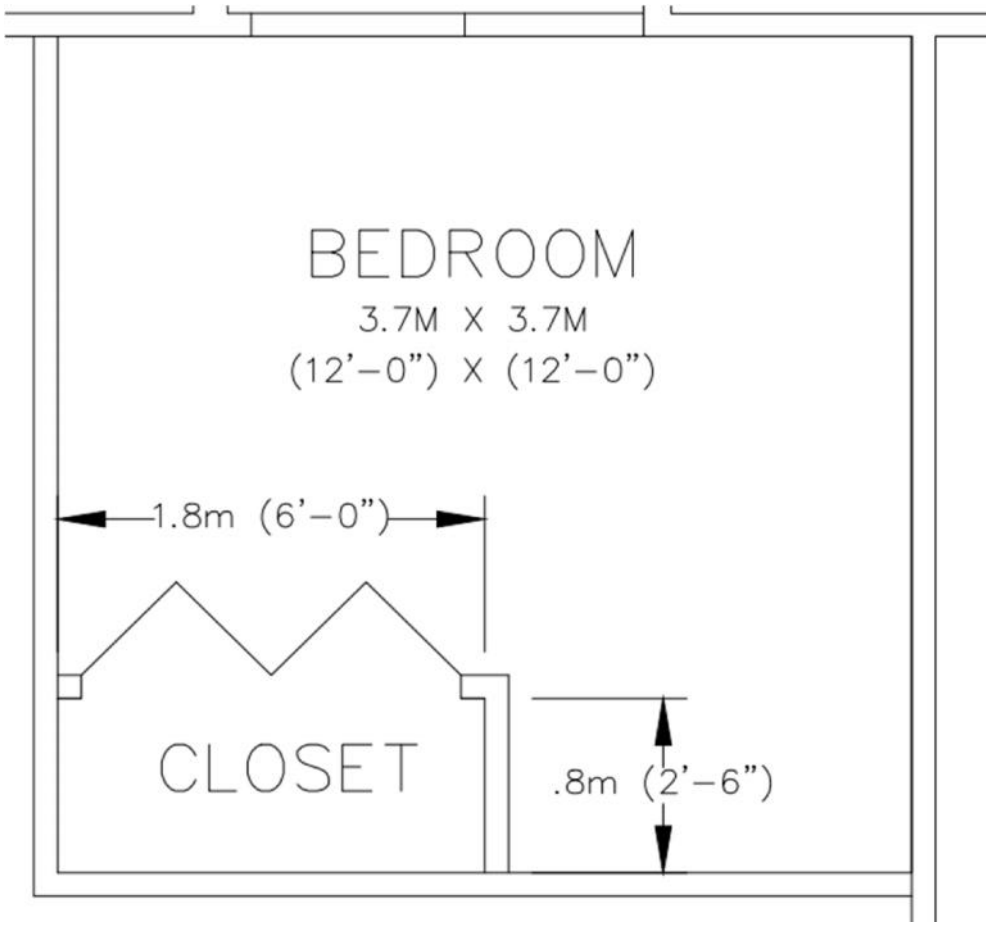
5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets – clothes closet
- Area does not exceed 2.2 sq. meters – 1.5 sq. meters
- Shortest dimension does not exceed .9m (3’-0”) - .8m
- Non or limited combustible finish

- Drywall walls and ceiling



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NFPA 13D Design and Calculations

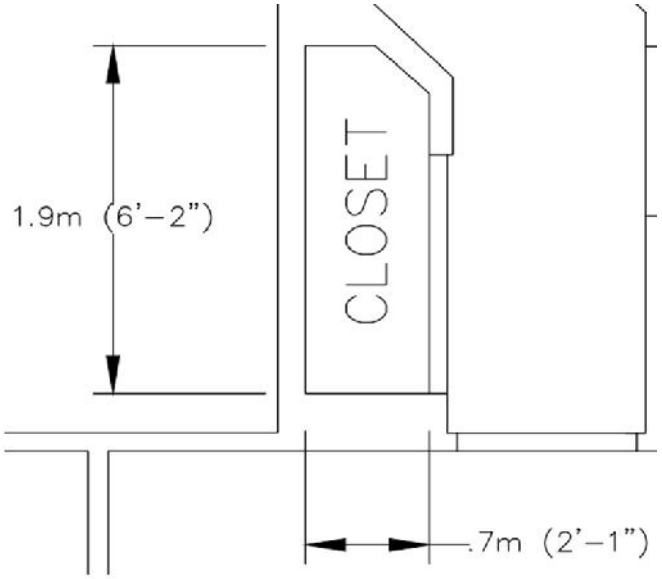
NFPA 13D Design

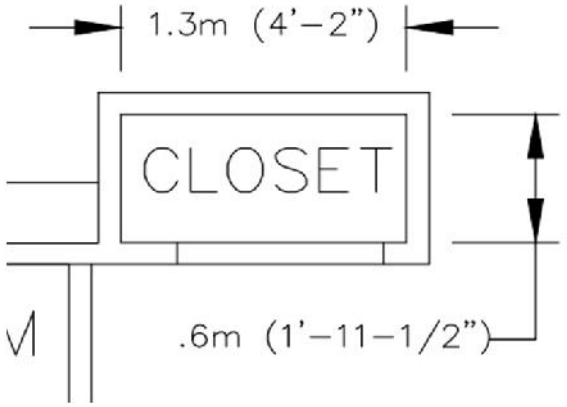
5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets
- Area does not exceed 2.2 sq. meters
- Shortest dimension does not exceed .9m
- Non or limited combustible finish





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NFPA 13D Design and Calculations

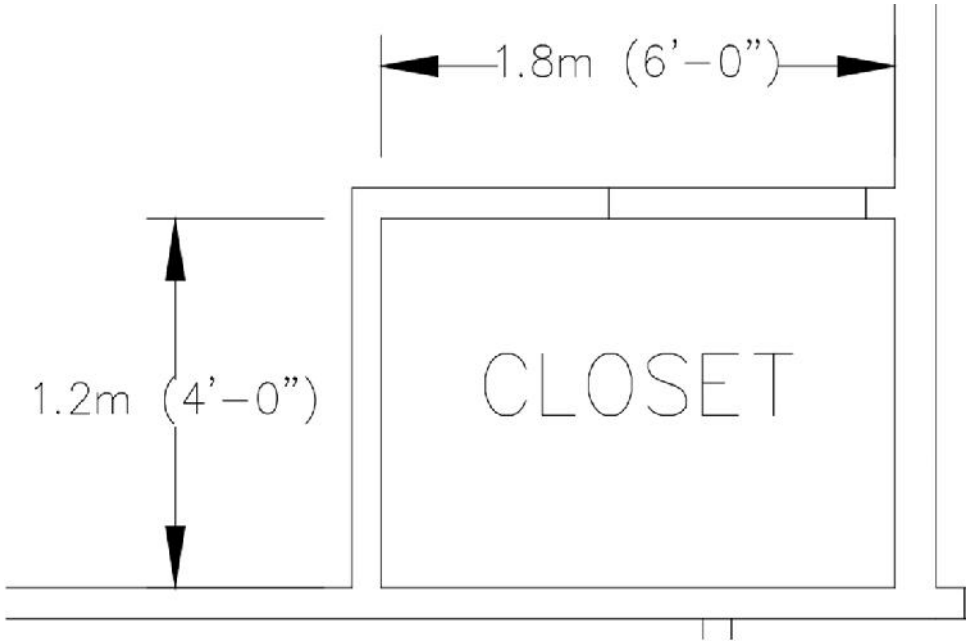
NFPA 13D Design

5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets
- Area does not exceed 2.2 sq. meters
- Shortest dimension does not exceed .9m
- Non or limited combustible finish



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NFPA 13D Design and Calculations

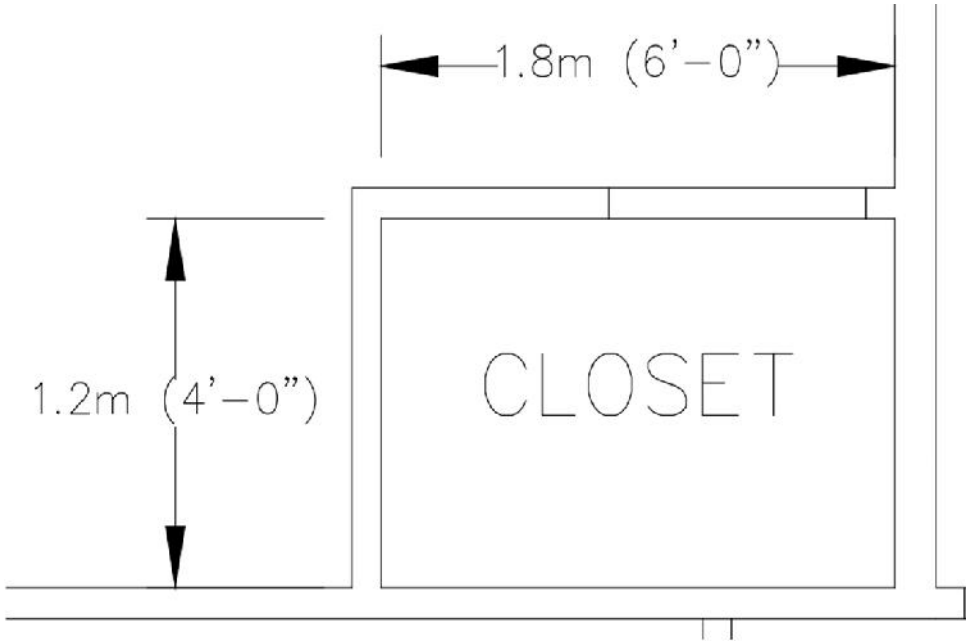
NFPA 13D Design

5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets – clothes closet
- Area does not exceed 2.2 sq. meters
- Shortest dimension does not exceed .9m
- Non or limited combustible finish



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NFPA 13D Design and Calculations

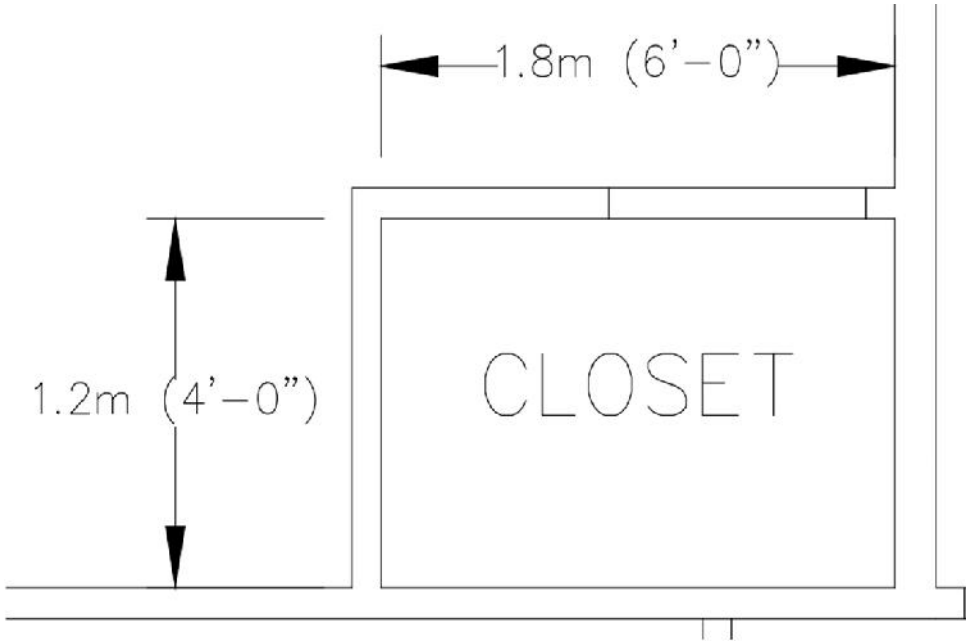
NFPA 13D Design

5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets – clothes closet
- Area does not exceed 2.2 sq. meters (24 sq. ft.) – 2.2 sq. meters
- Shortest dimension does not exceed .9m
- Non or limited combustible finish



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NFPA 13D Design and Calculations

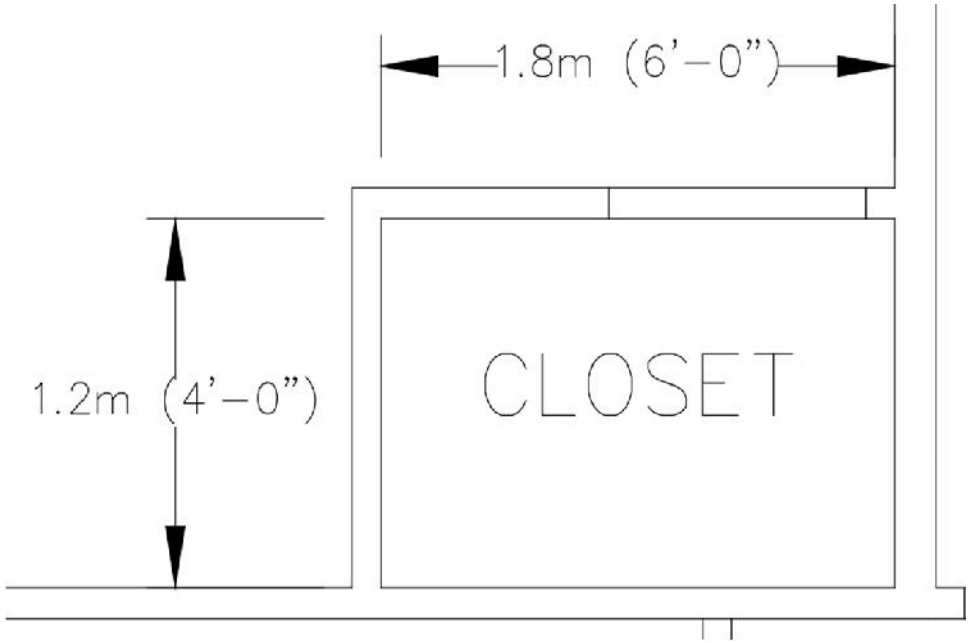
NFPA 13D Design

5) Which area require protection?

Will this closet require a sprinkler?

Section 8.3.3

- Sprinkler not required in clothes closets – clothes closet
- Area does not exceed 2.2 sq. meters (24 sq. ft.) – 2.2 sq. meters (24 sq. ft.)
- Shortest dimension does not exceed .9m (3'-0") - 1.2m (4'-0")
- Non or limited combustible finish



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NFPA 13D Design and Calculations

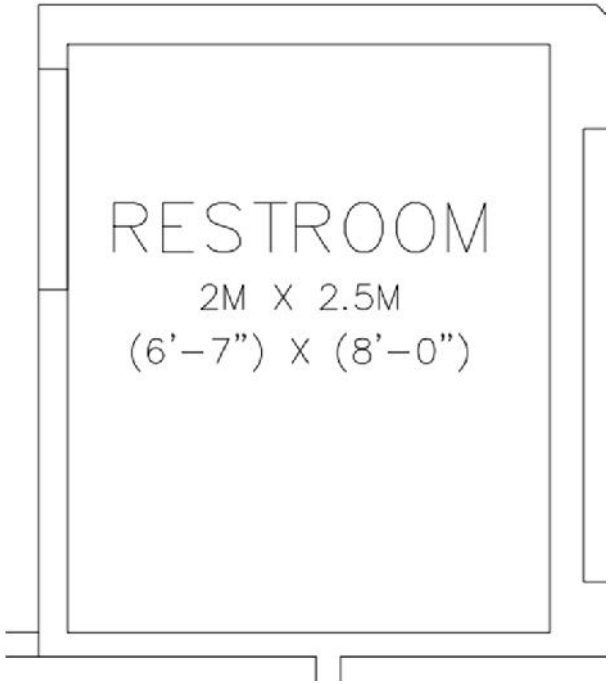
NFPA 13D Design

5) Which area require protection?

Will this restroom require a sprinkler?

Section 8.3.2

- Sprinkler not required in bathrooms 5.1 sq. meters (55 sq. ft.) or less



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NFPA 13D Design and Calculations

NFPA 13D Design

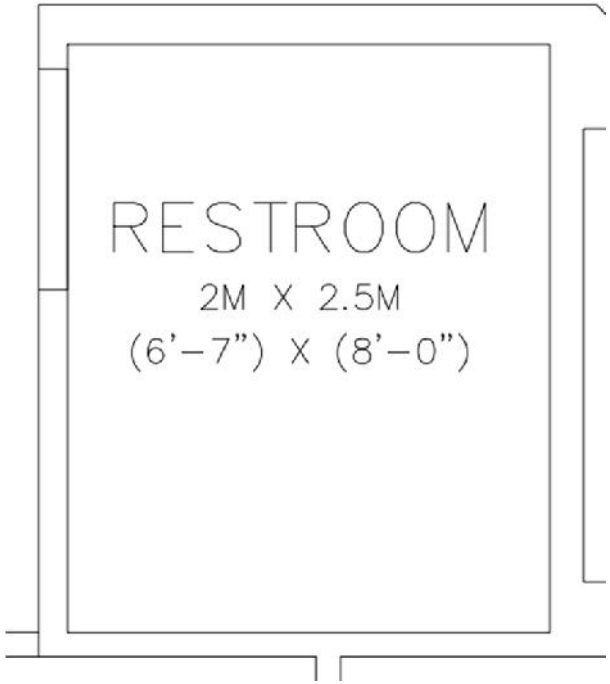
5) Which area require protection?

Will this restroom require a sprinkler?

Section 8.3.2

- Sprinkler not required in bathrooms 5.1 sq. meters (55 sq. ft.) or less

- Restroom = 5 sq. meters (53 sq. ft.)



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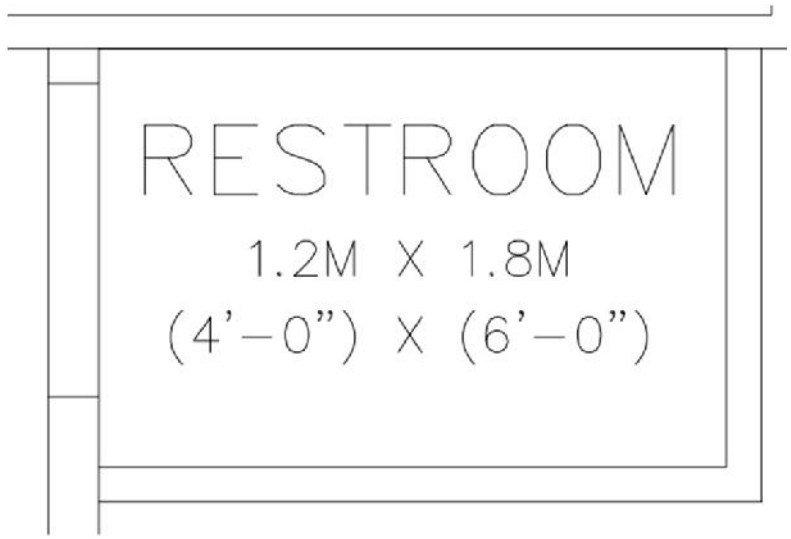
NFPA 13D Design

5) Which area require protection?

Will this restroom require a sprinkler?

Section 8.3.2

- Sprinkler not required in bathrooms 5.1 sq. meters (55 sq. ft.) or less



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NFPA 13D Design

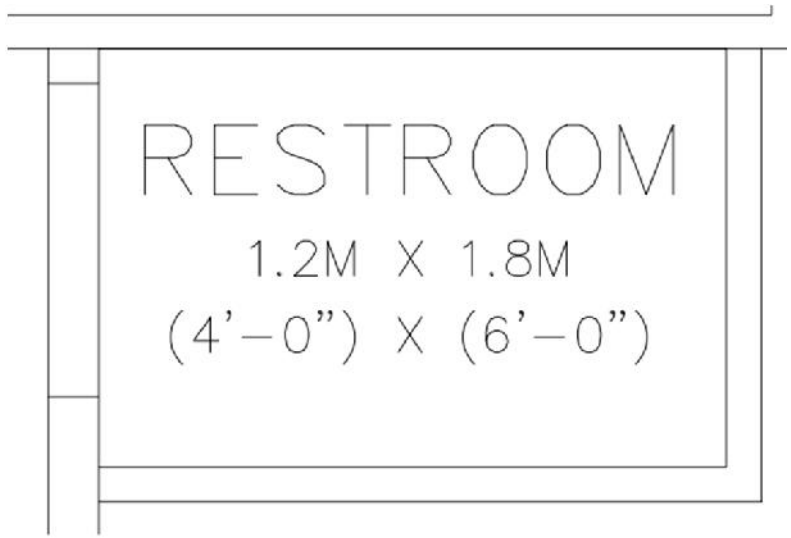
5) Which area require protection?

Will this restroom require a sprinkler?

Section 8.3.2

- Sprinkler not required in bathrooms 5.1 sq. meters (55 sq. ft.) or less

- Restroom = 2.2 sq. meters (24 sq. ft.)



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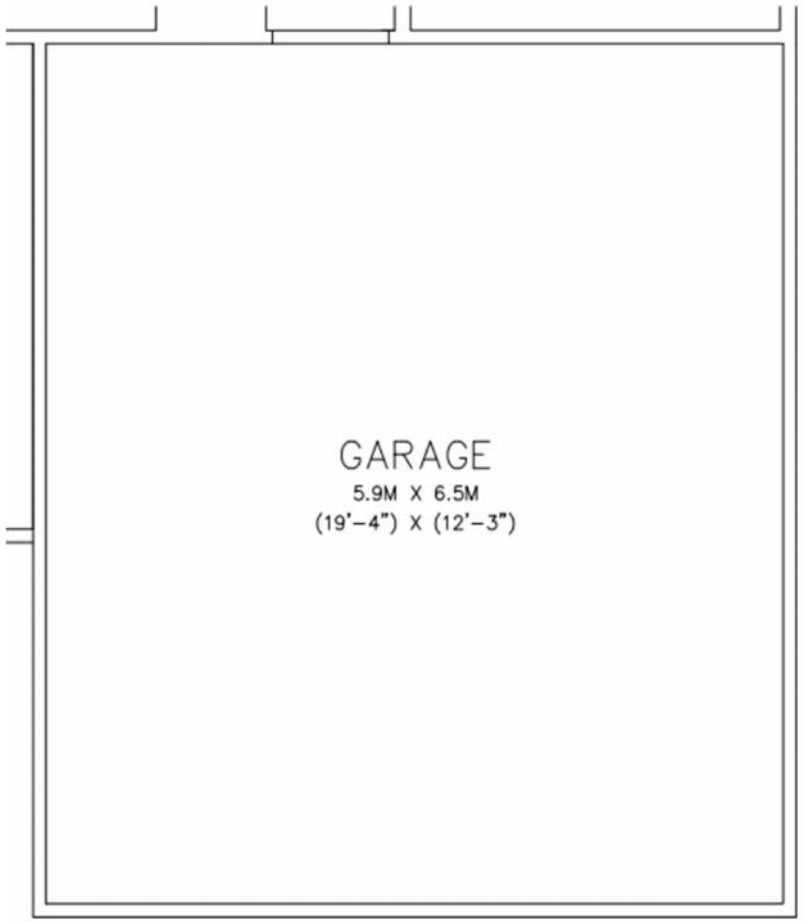
NFPA 13D Design

5) Which areas require protection?

Will this Garage require a sprinkler(s)?

Section 8.3.4
- Sprinklers not required in garages, open attached porches, carports, and similar structures.



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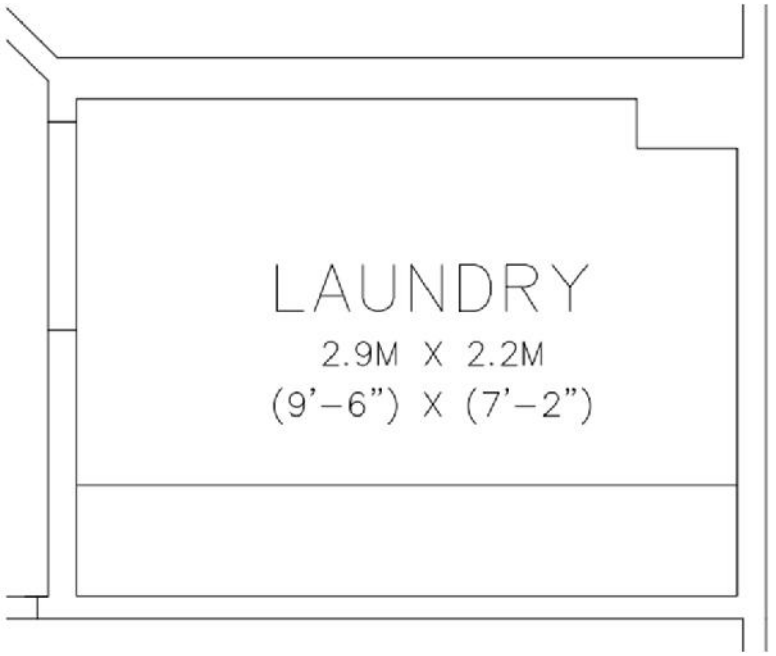
NFPA 13D Design

5) Which area require protection?

Will this Laundry area require a sprinkler?



Section 8.3.9

- Sprinklers installed in any closet used for heating and/or air conditioning equipment, washers and/or dryers, or water heaters except as allowed by 8.3.8.

Section 8.3.8
Sprinklers not required in closets in garages, regardless of size.

- No openings to dwelling unit

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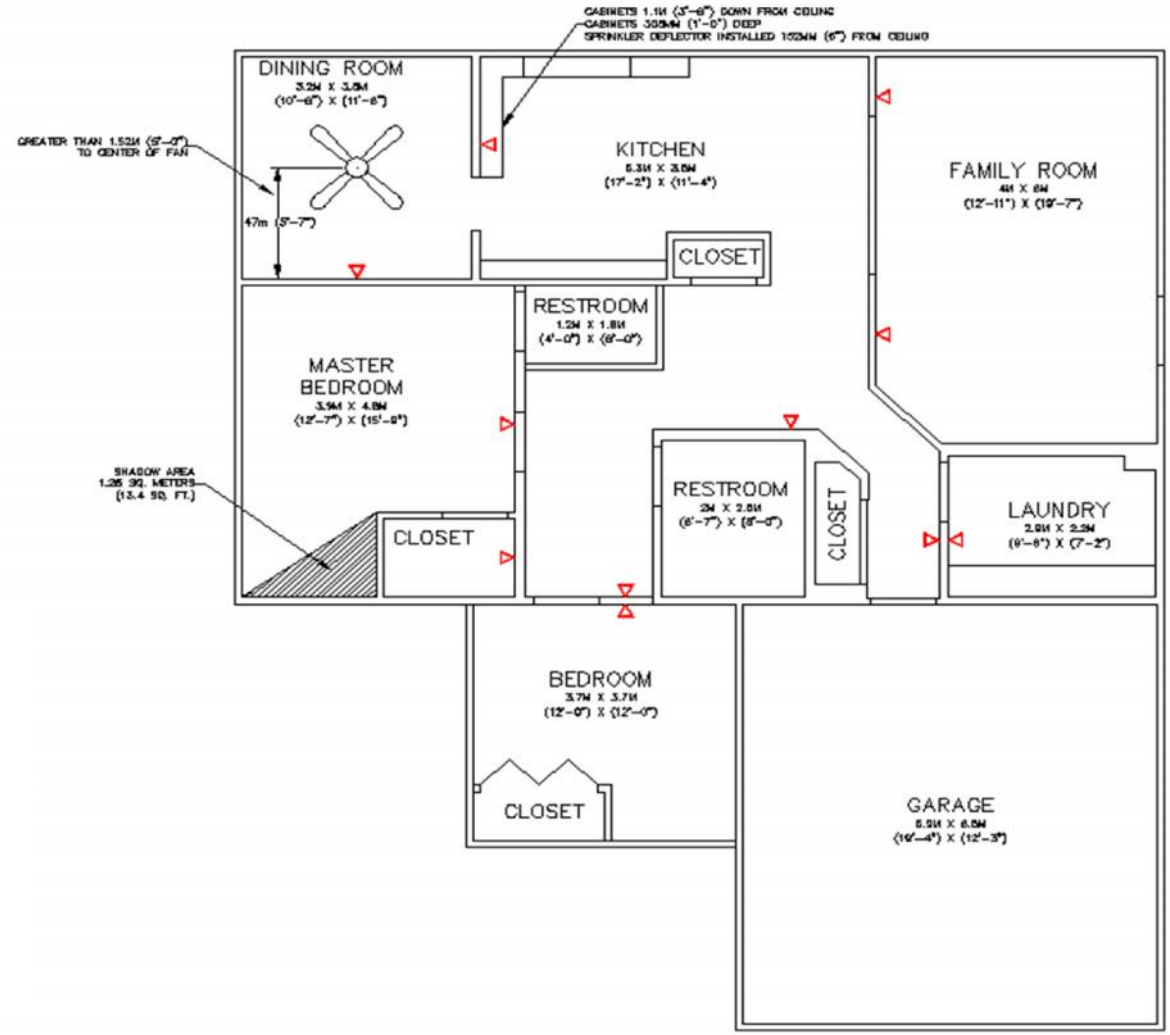
NFPA 13D Design

NFPA 13D Layout

Viking VK480 Concealed Horizontal Sidewall sprinklers

Why sidewalls?



NFPA 13D Design and Calculations

NFPA 13D Design

Section 8.2.5.7 Shadow areas shall be permitted in the protection area of a sprinkler as long as the cumulative dry areas do not exceed 1.4 sq. meters (15 sq. ft.)

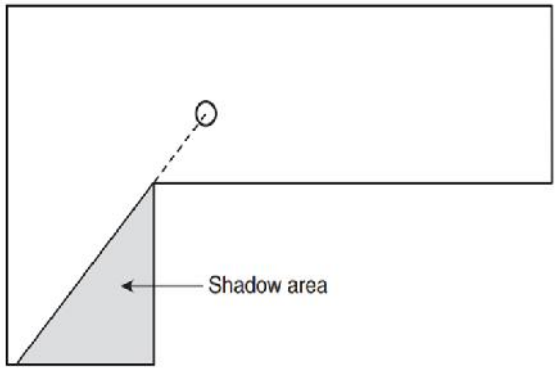
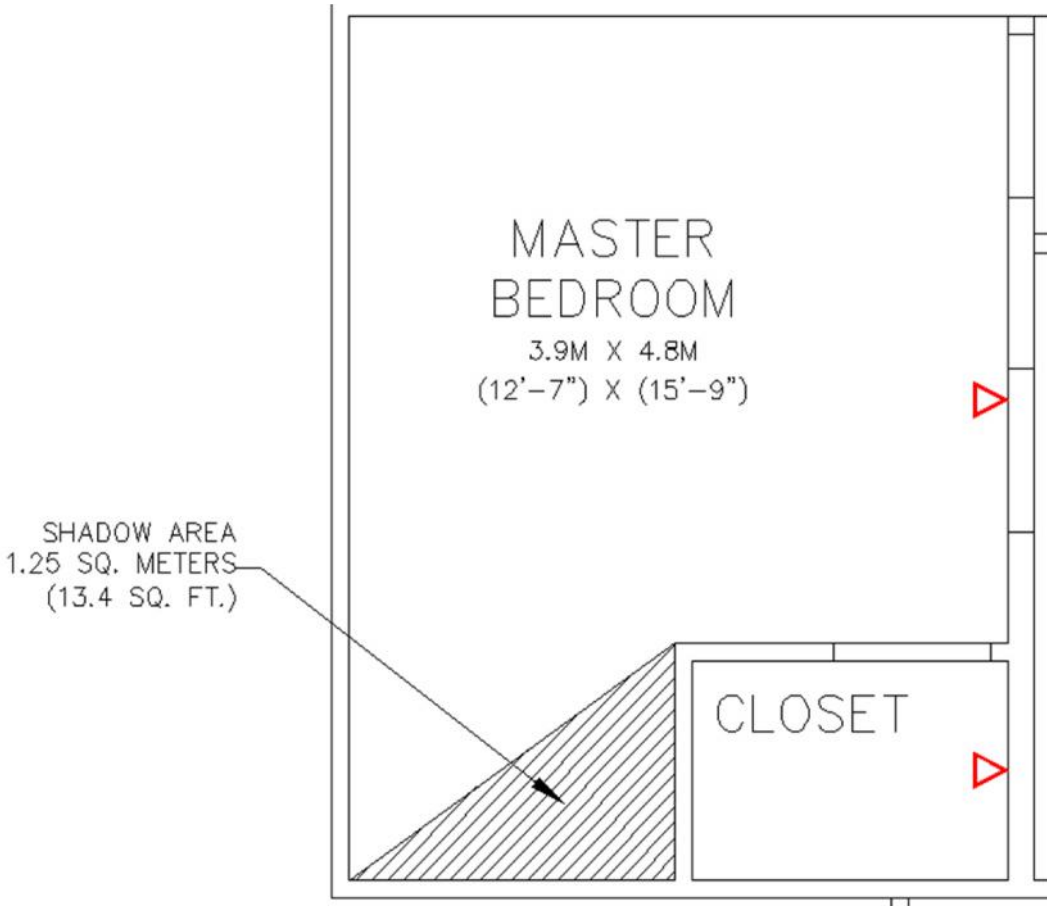


FIGURE A.3.3.9 Shadow Area Created by a Wall.



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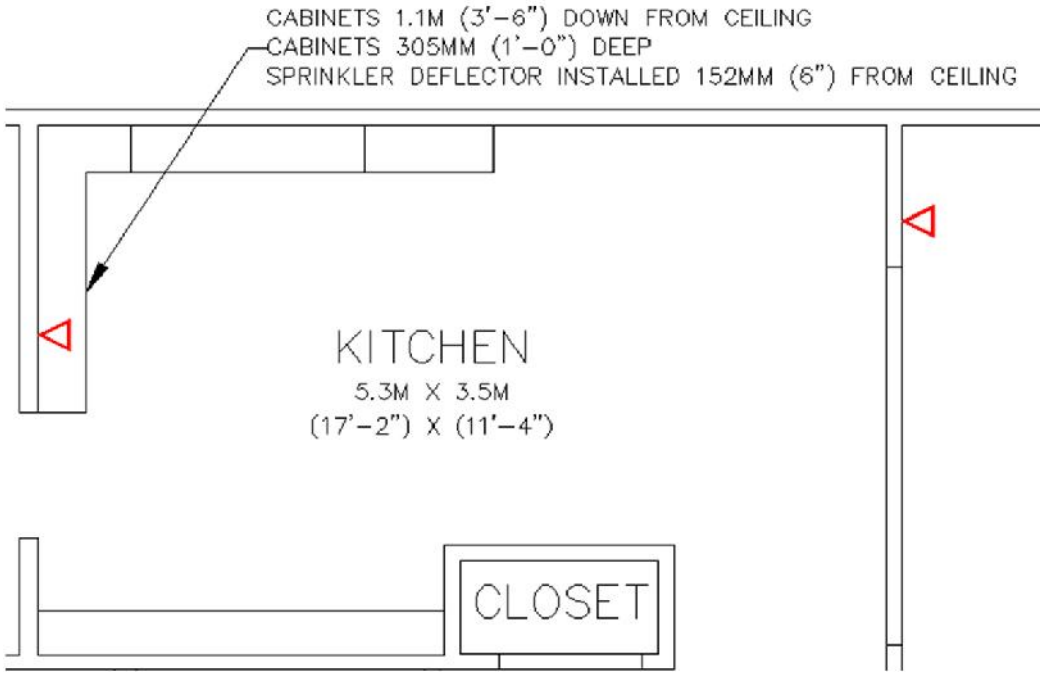
NFPA 13D Design

Where sidewall sprinklers are more than 0.91m (3ft.) above the top of cabinets, the sprinkler shall be permitted to be installed on the wall above the cabinets where the cabinets are not greater than 305mm (12in.) form the wall.



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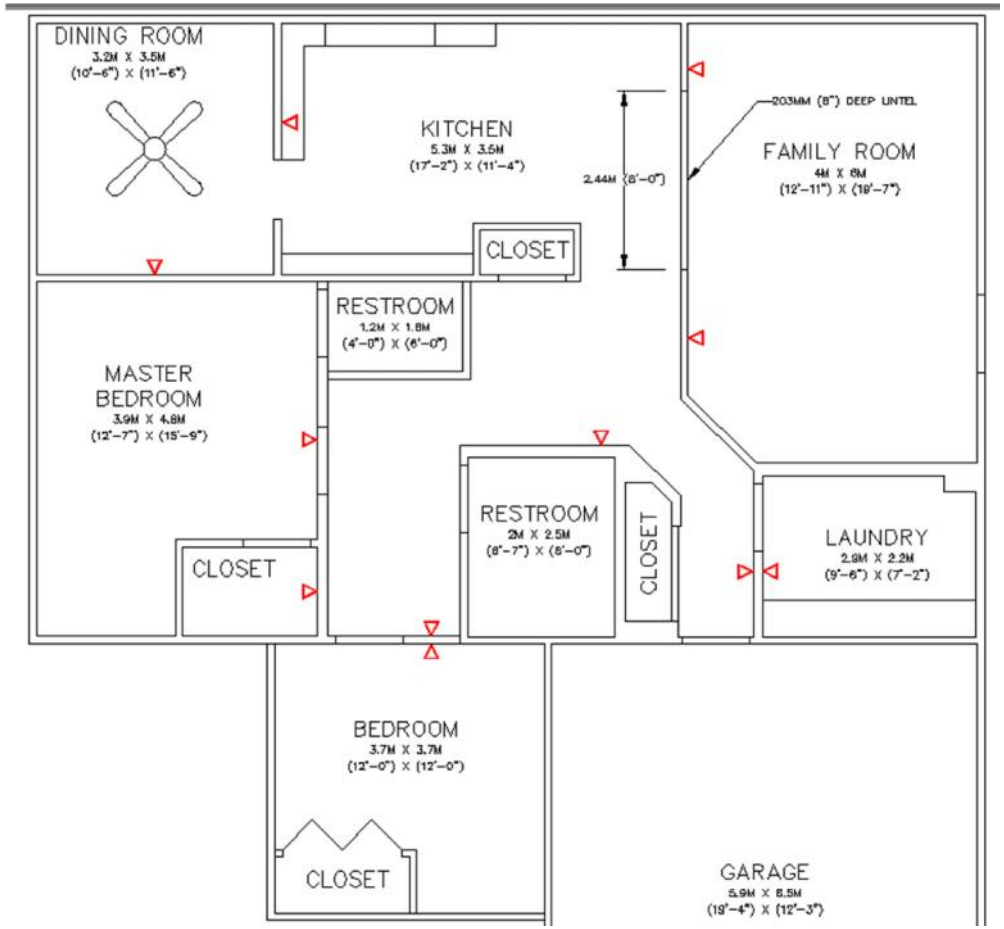
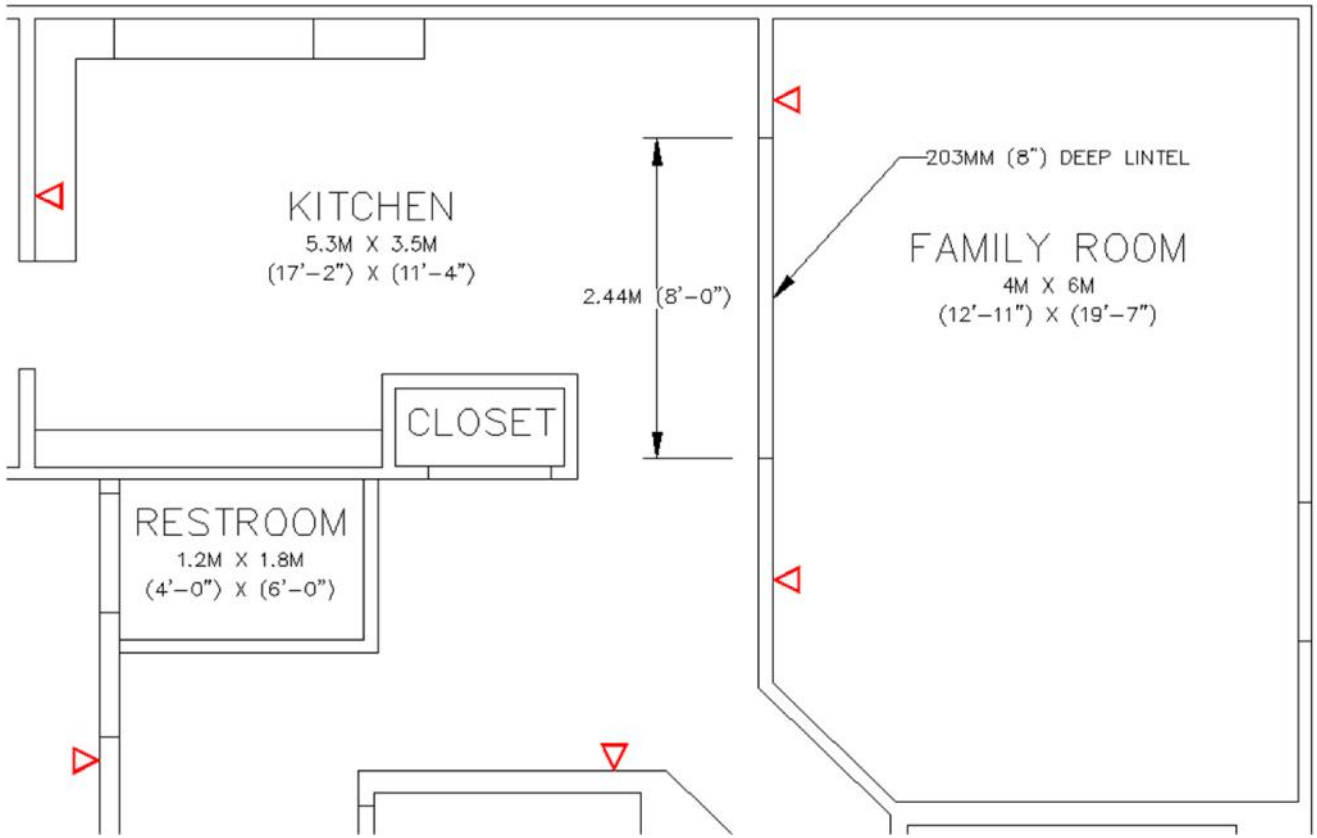
- Which two sprinklers are the most demanding?



NFPA 13D Design and Calculations

NFPA 13D Design

- Which two sprinklers are the most demanding?



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NFPA 13R Design and Calculations

NFPA 13R Design

NFPA 13 R – Residential Occupancies up to and Including Four Stories in Height

NFPA 13 R – (4) Head Design at listed flows and pressures

- 30 minute water supply

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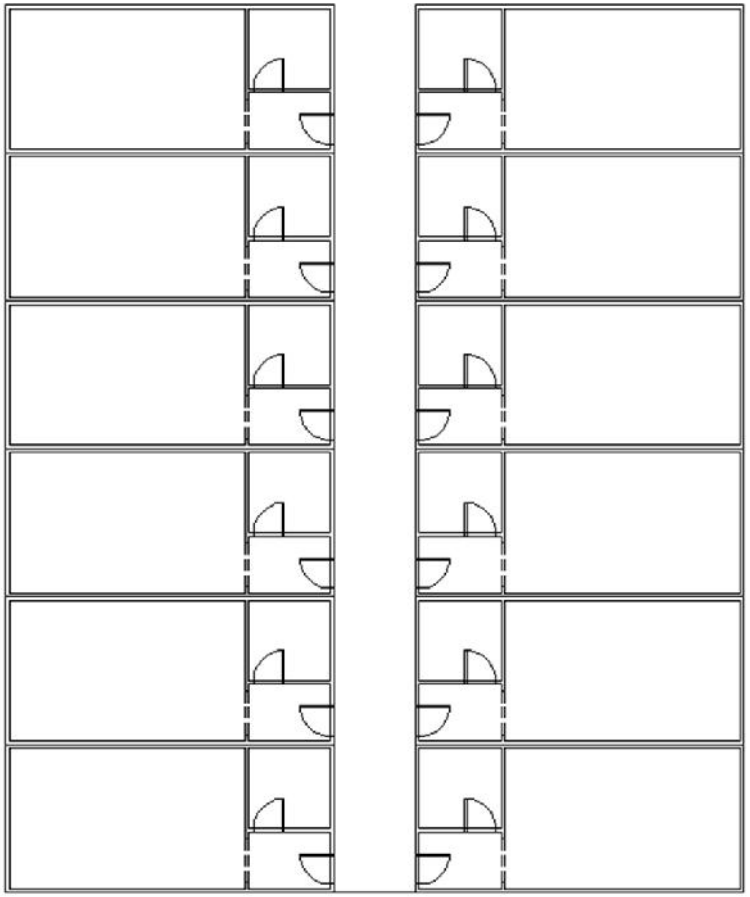
NFPA 13R Design and Calculations

NFPA 13R Design

- Typical hotel room layout

- 3rd Floor (3 stories)

- Water supply location



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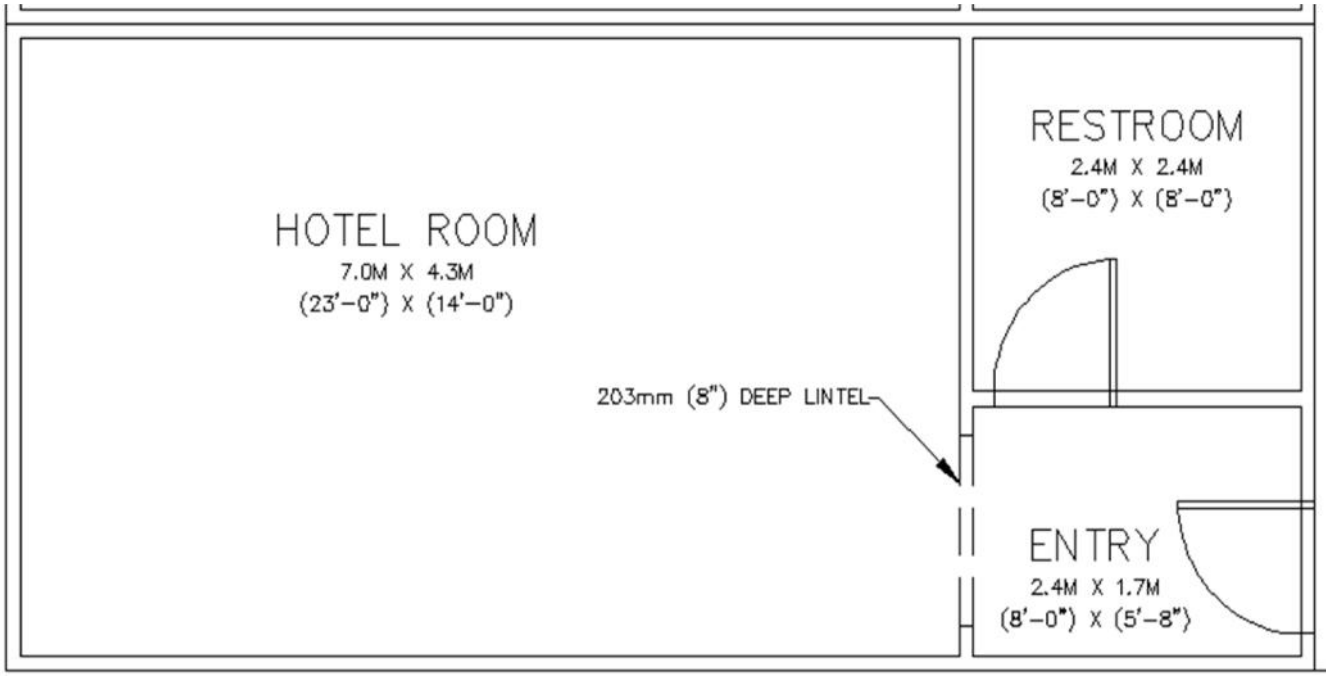
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Hotel Room?



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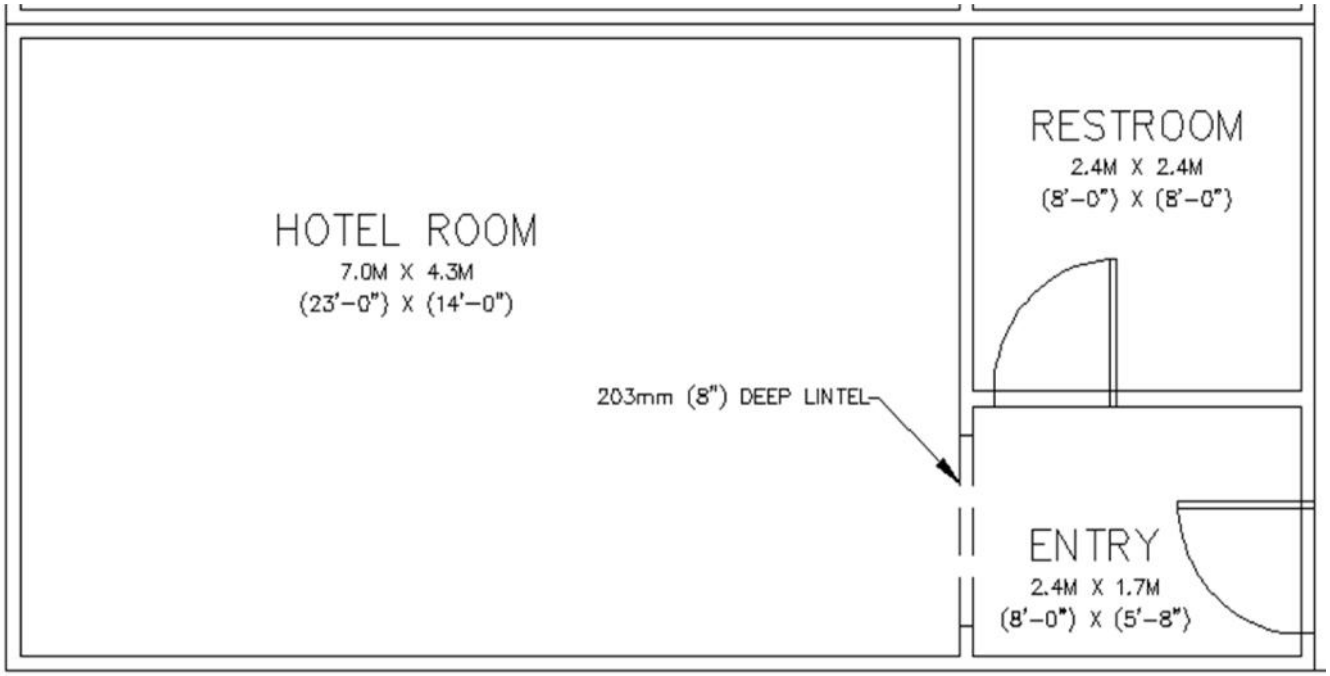
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Hotel Room?
YES



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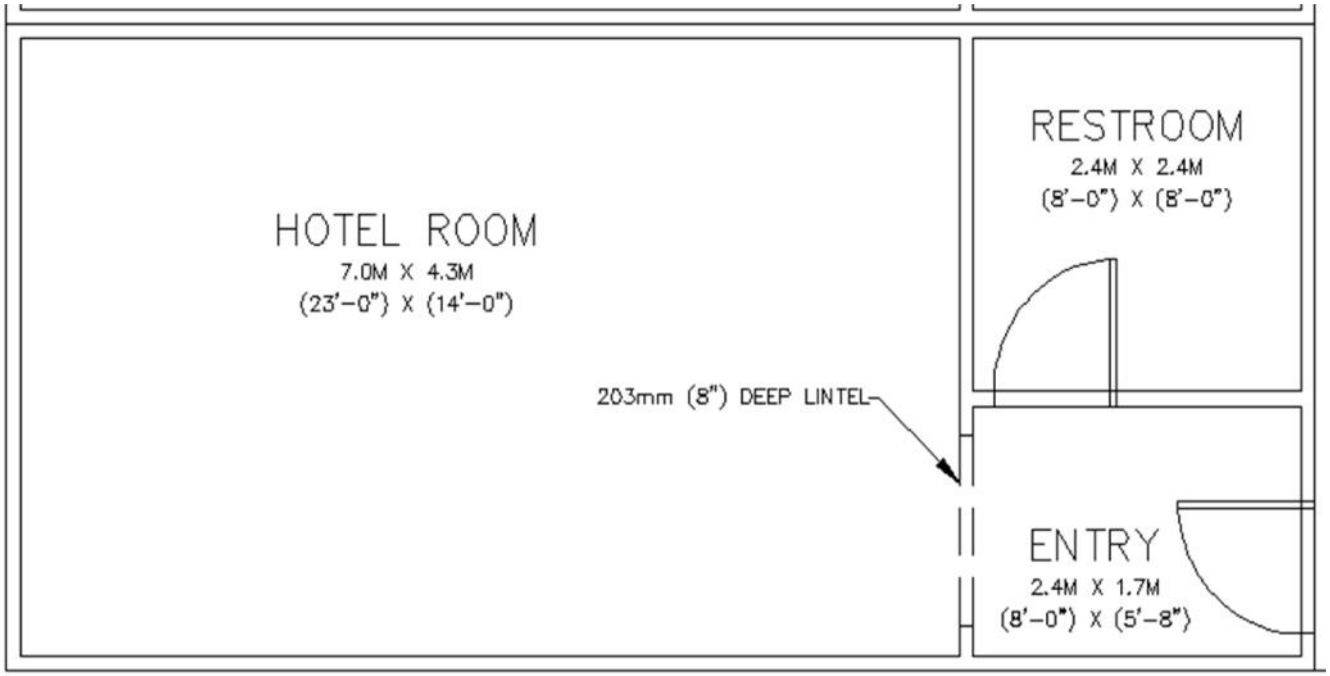
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Entry?



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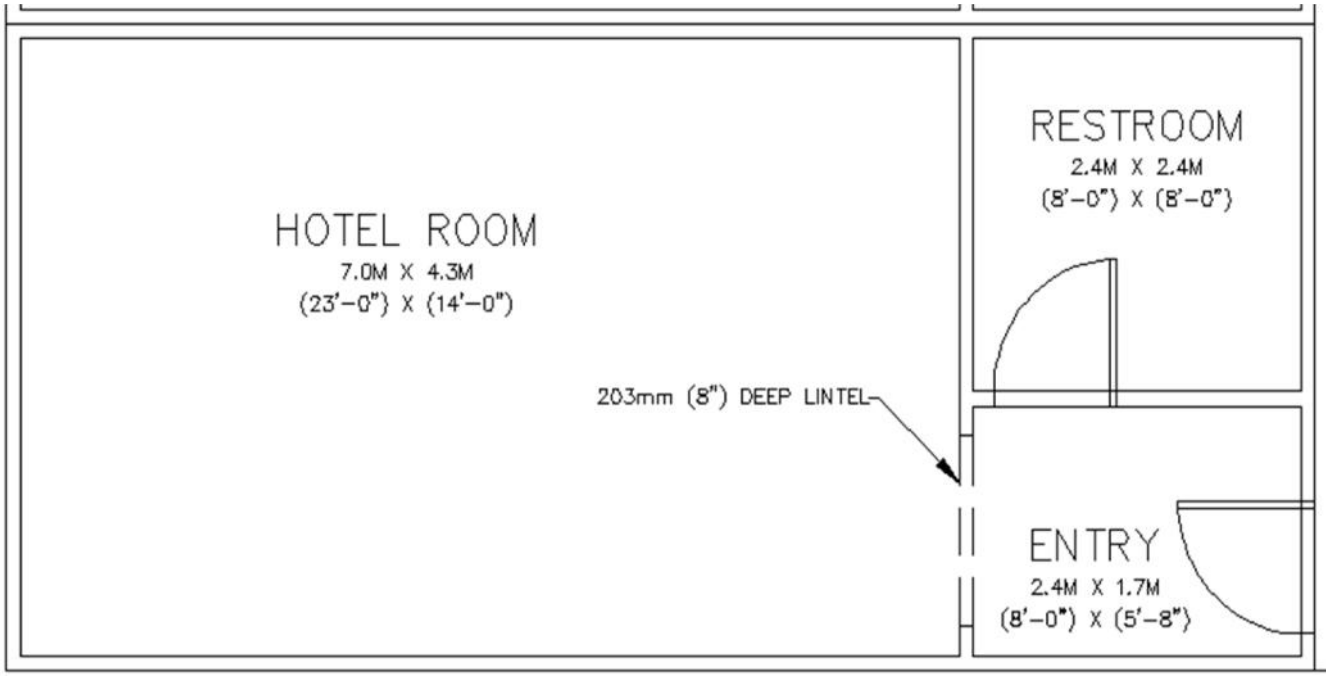
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Entry?
YES



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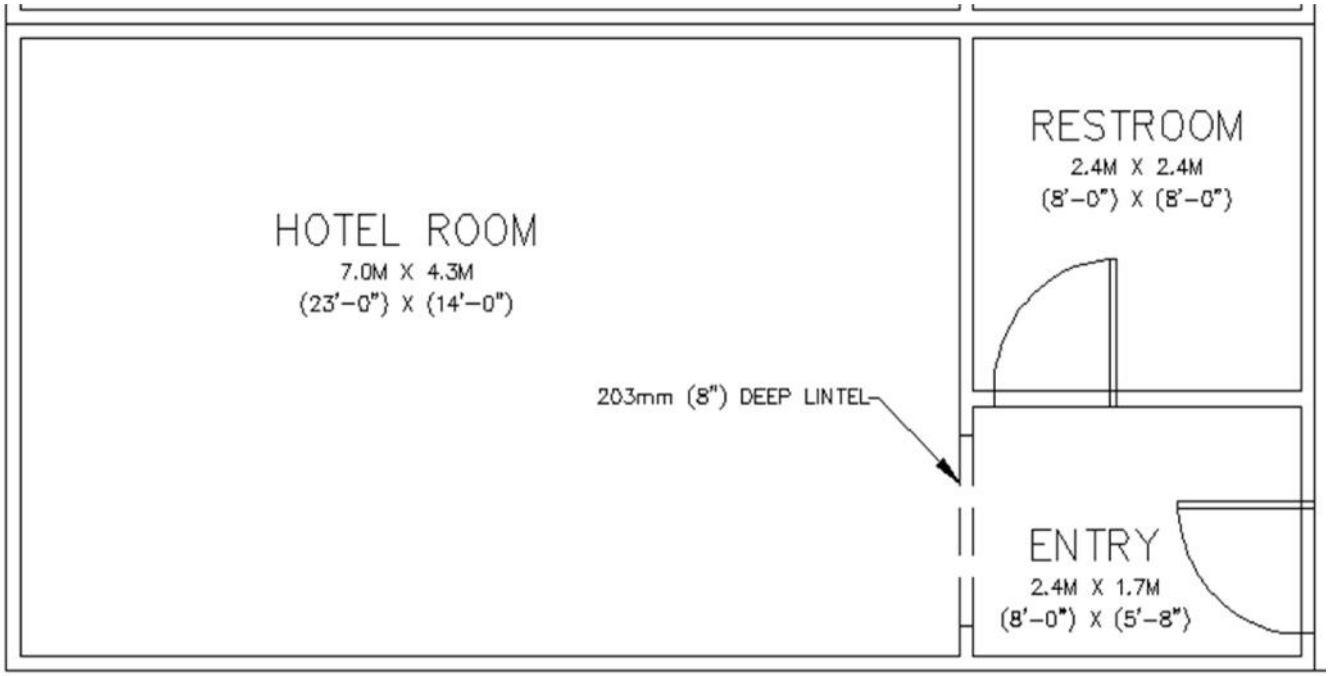
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Restroom?



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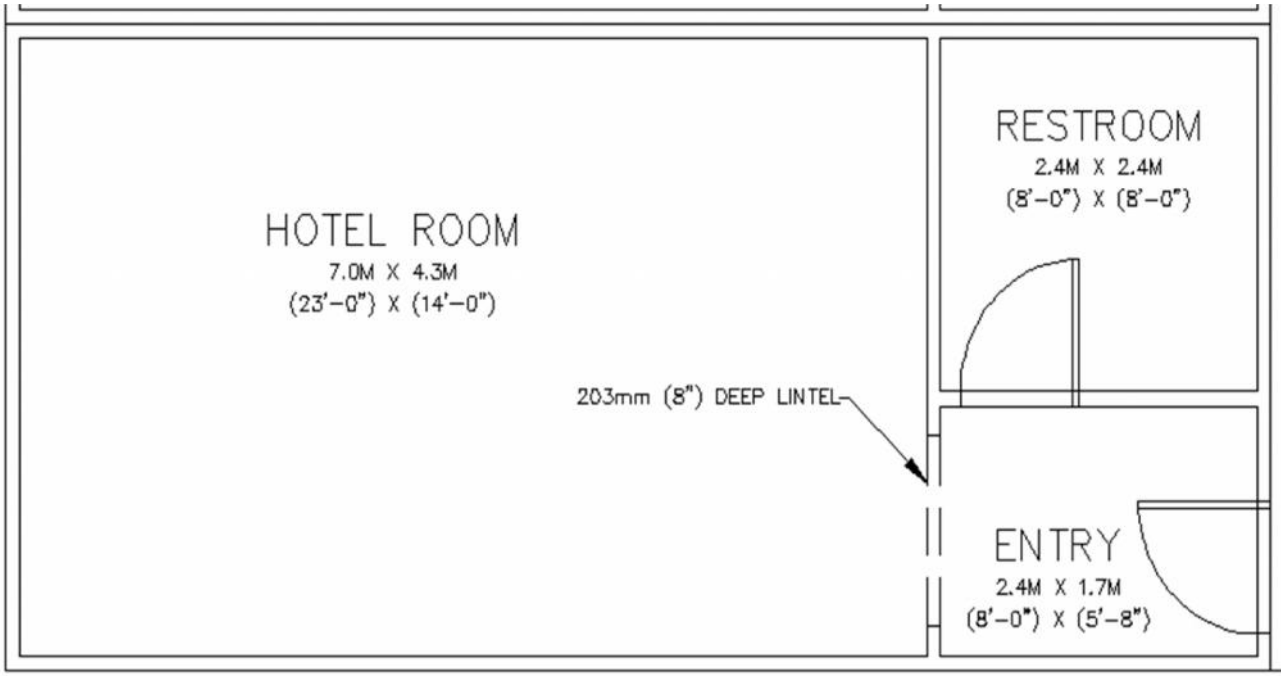
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Restroom?

NFPA 13R – Sprinklers not required in bathrooms where the area does not exceed 5.1 sq. meters



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NFPA 13R Design and Calculations

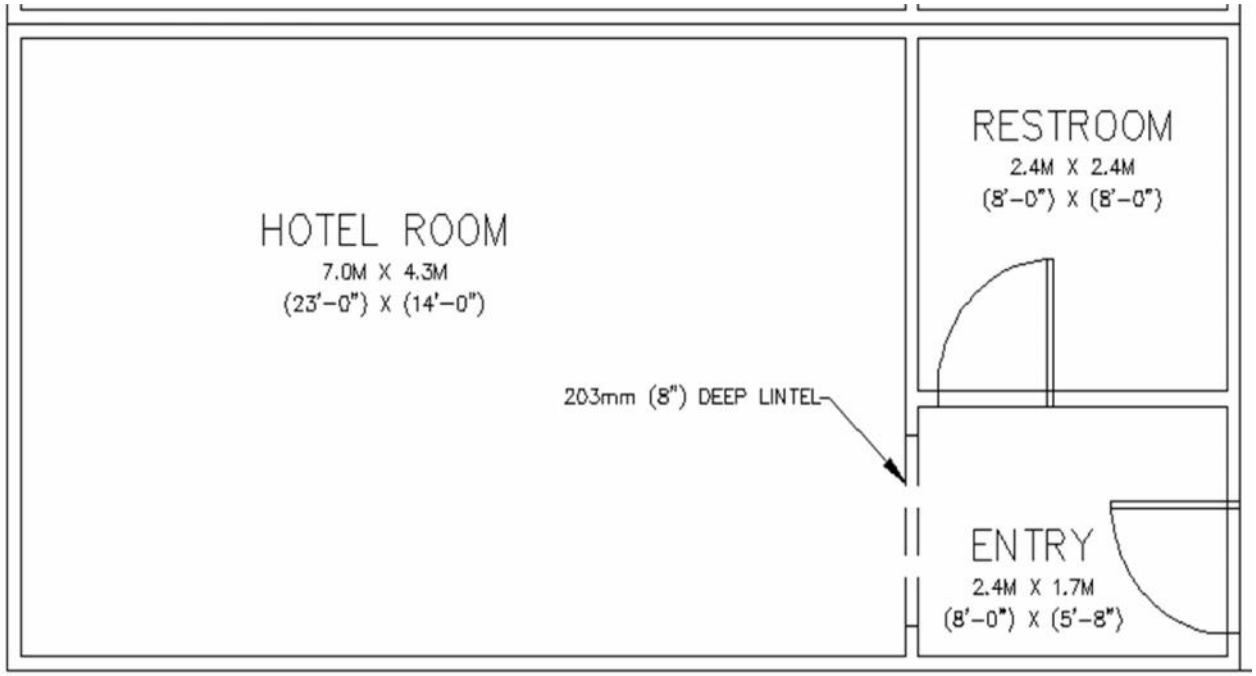
NFPA 13R Design

Which areas of the room will require protection?

Restroom?

NFPA 13R – Sprinklers not required in bathrooms where the area does not exceed 5.1 sq. meters

2.4m x 2.4m = 5.8 sq. meters



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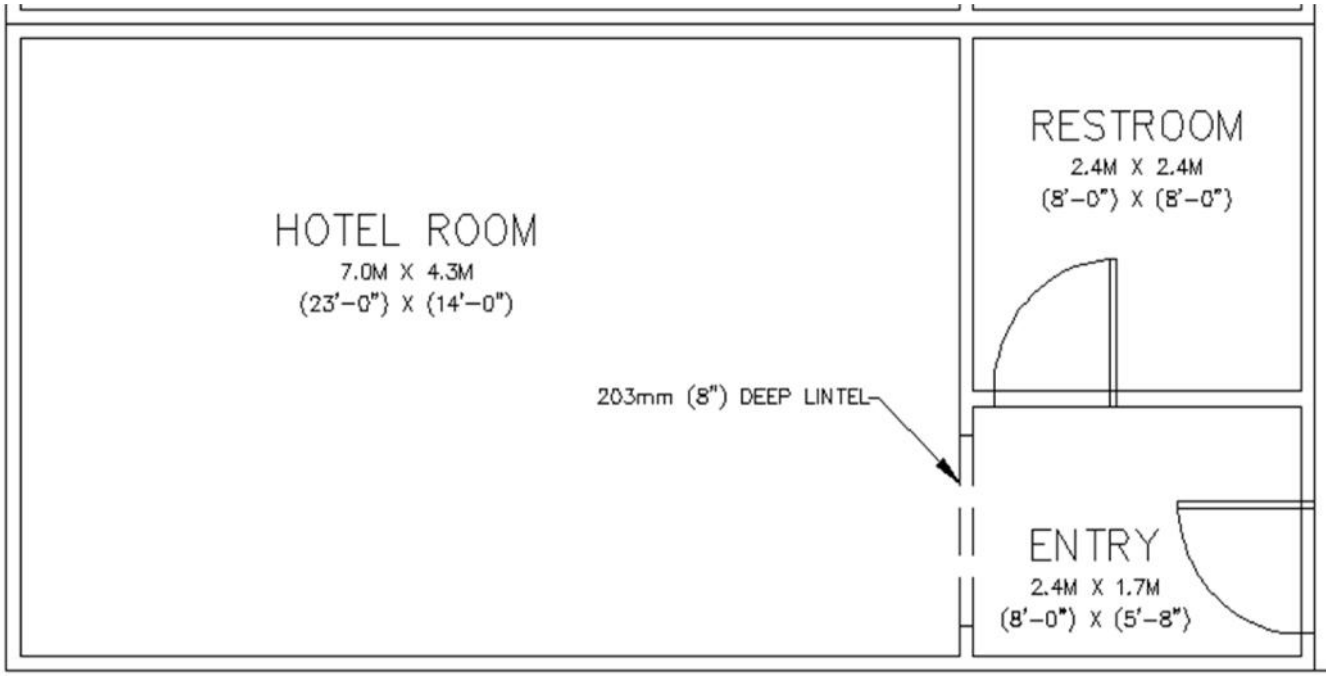
NFPA 13R Design and Calculations

NFPA 13R Design

Which areas of the room will require protection?

Restroom?
YES



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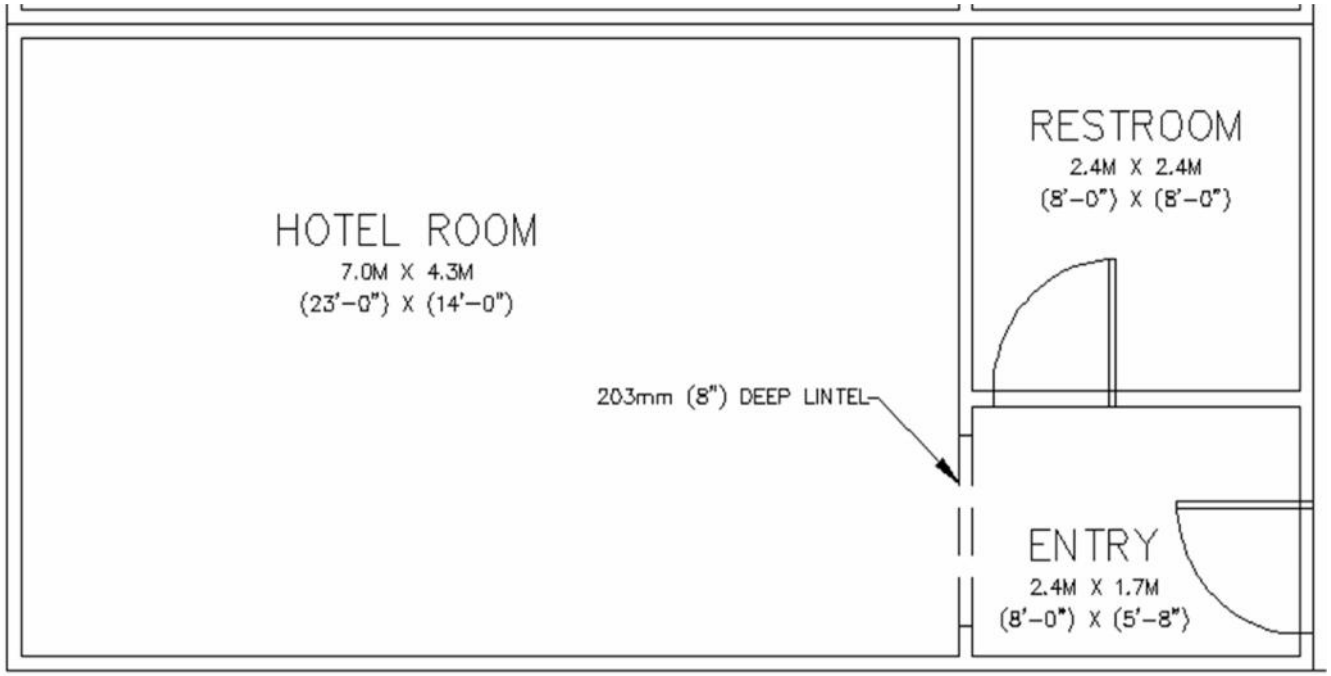
NFPA 13R Design

Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Hotel Room?



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NFPA 13R Design and Calculations

NFPA 13R Design

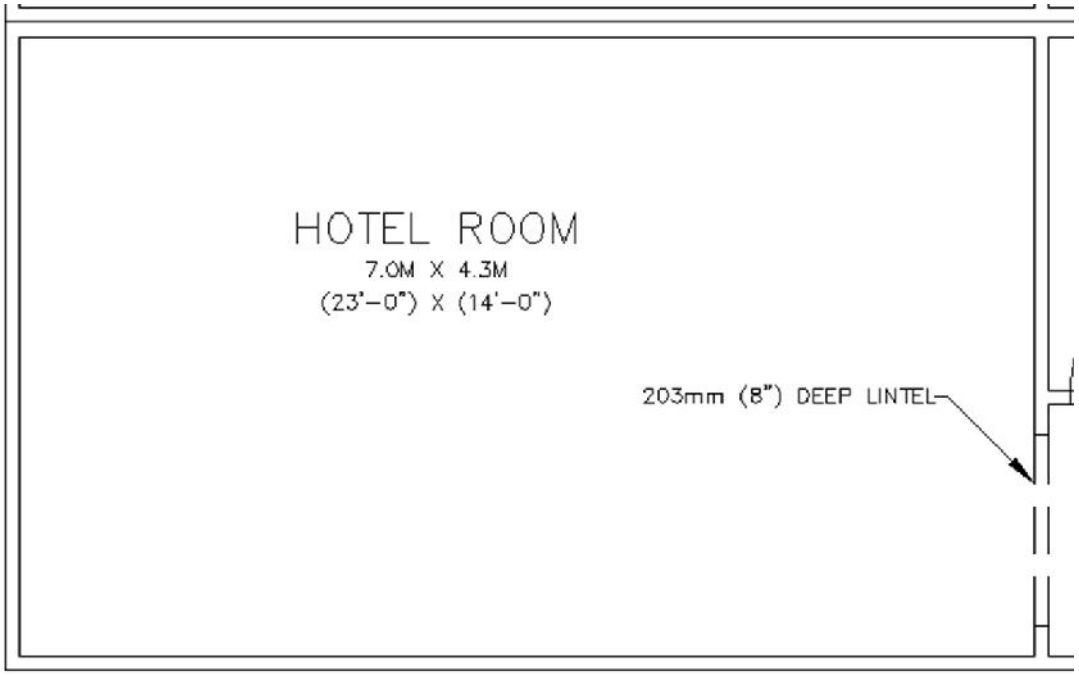
Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- 7.0m x 4.3m

- Viking Residential Sidewalls

- VK486 – 57.7 K (4.0)
- VK484 – 57 K (4.2)
- VK460 – 83.6 K (5.8)
- VK480 – 57.7 K (4.0)



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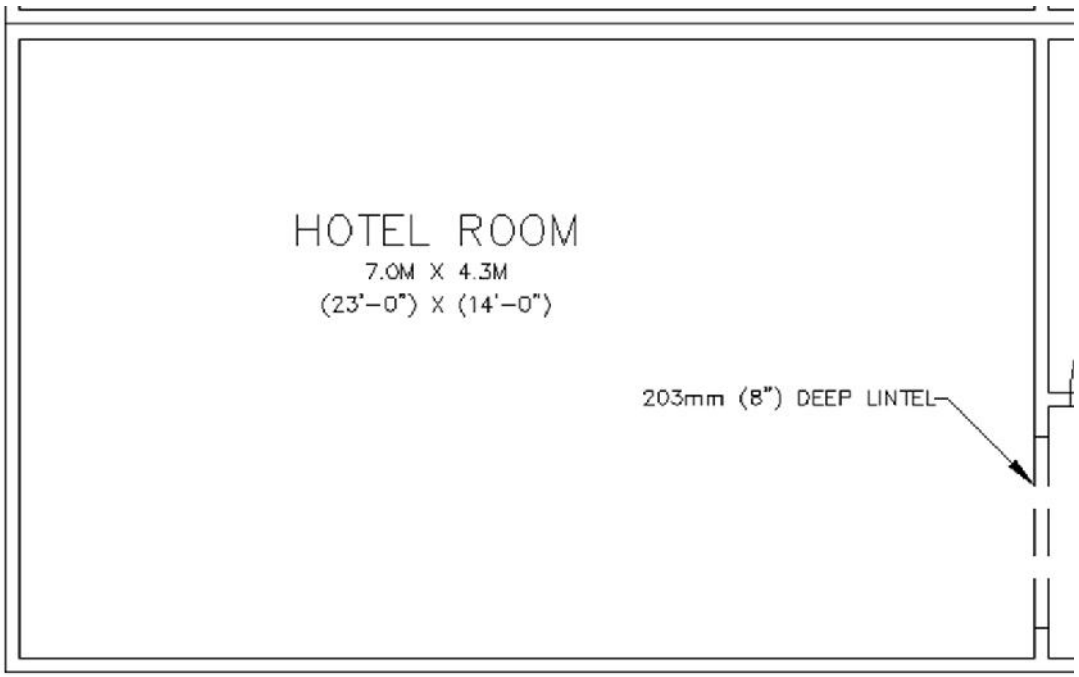
NFPA 13R Design and Calculations

NFPA 13R Design

Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection
- 7.0m x 4.3m
- Viking Residential Sidewalls
- VK486 – 57.7 K (4.0)
- VK484 – 57 K (4.2)
- VK460 – 83.6 K (5.8)
- VK480 – 57.7 K (4.0)



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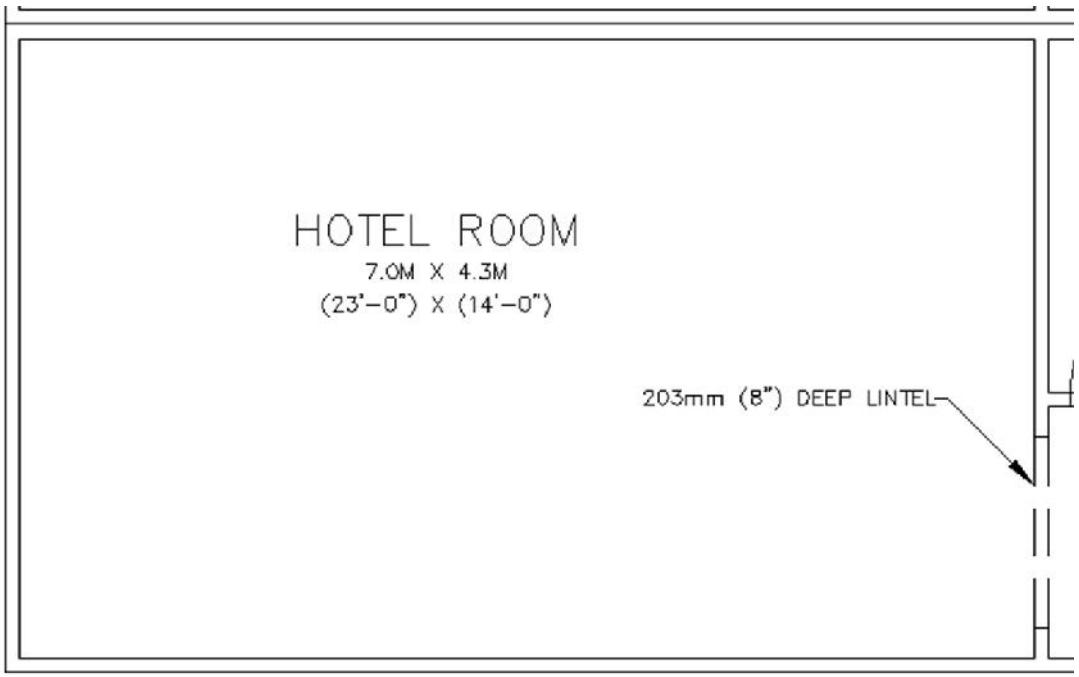
NFPA 13R Design

Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection
- 7.0m (23’-0”) x 4.3m (14’-0”)
- Viking Residential Sidewalls
- Why VK460?
- 4.9m x 7.3m



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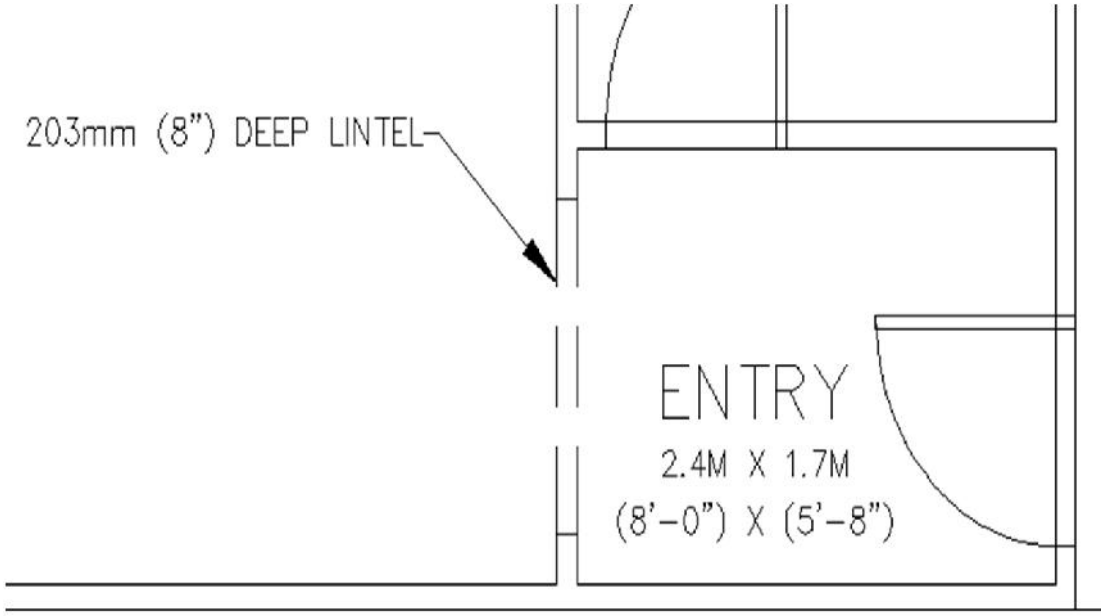
NFPA 13R Design

Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Entry?



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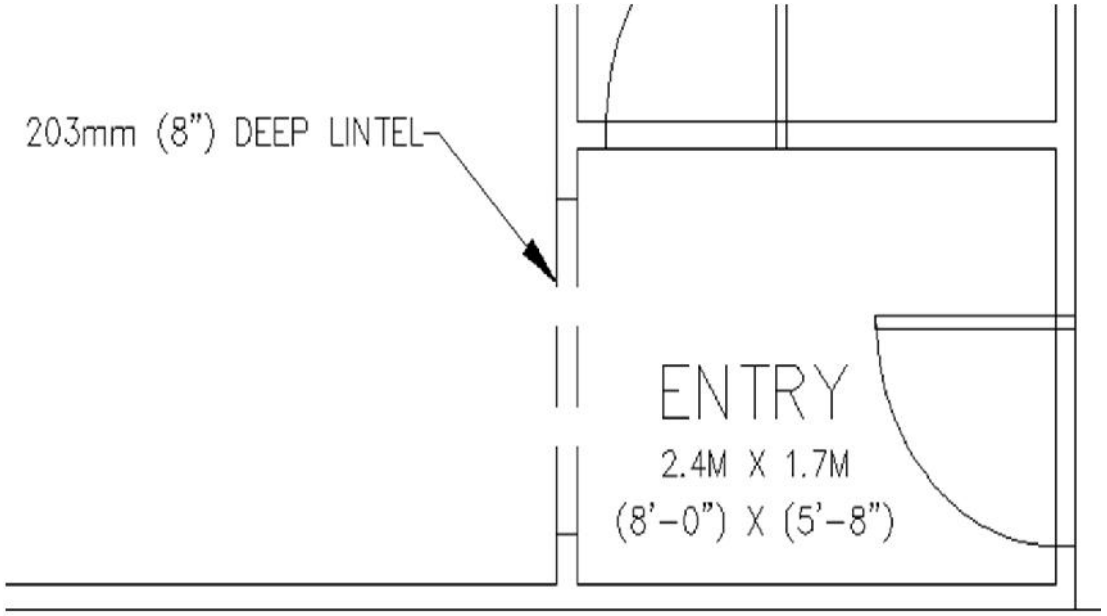
Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Entry?

Viking Residential Pendent Sprinklers

VK488 – 43.2K (3.0)
VK470 – 43.2K (3.0)
VK466 – 74.9 K (5.2)
VK458 – 107 K (7.4)



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NFPA 13R Design and Calculations

NFPA 13R Design

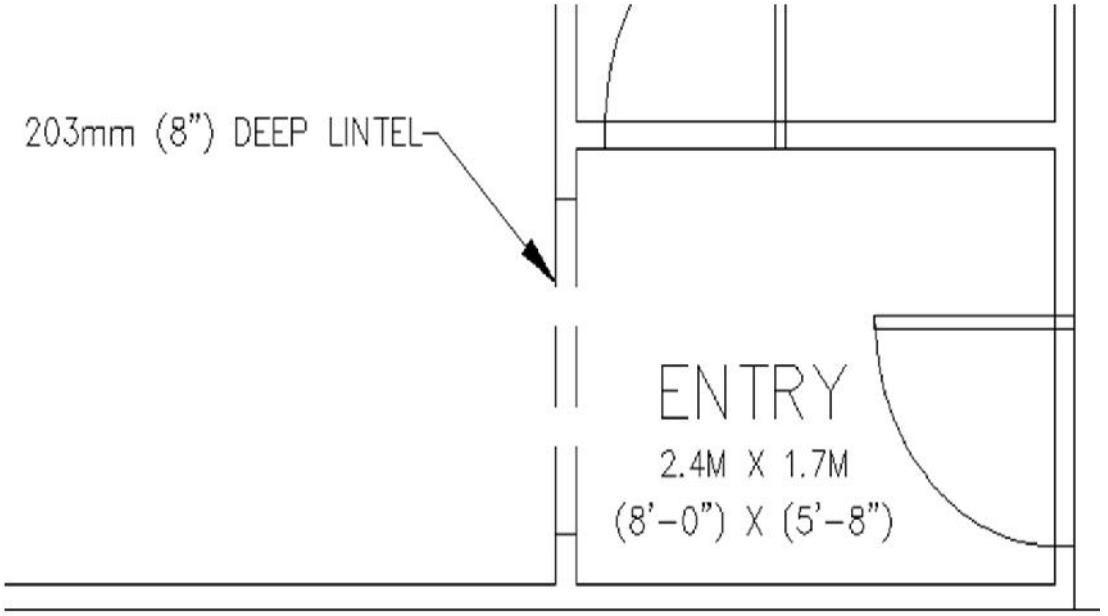
Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Entry?

Viking Residential Pendent Sprinklers

VK488 – 43.2K (3.0)
VK470 – 43.2K (3.0)
VK466 – 74.9 K (5.2)
VK458 – 107 K (7.4)



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NFPA 13R Design

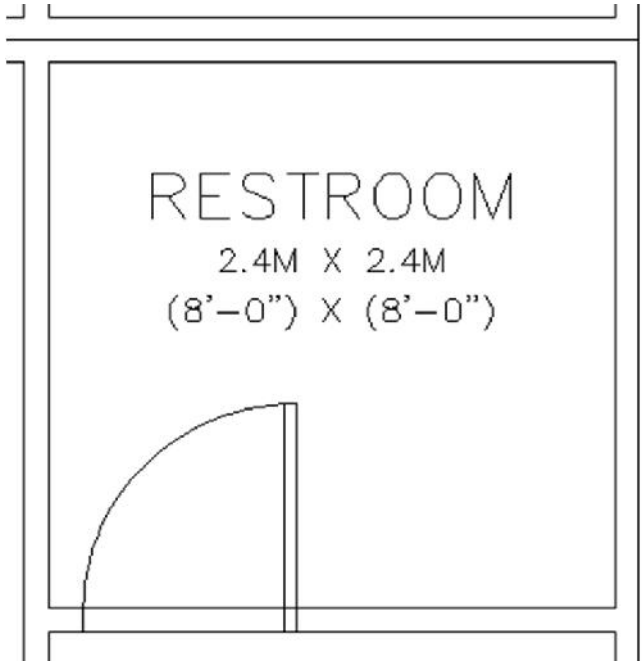
Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Restroom?

Viking Residential Pendent Sprinklers

VK468 – 70.6K (4.9)
VK470 – 43.2K (3.0)
VK430 – 62K (4.3)
VK488 – 43.2K (3.0)



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NFPA 13R Design and Calculations

NFPA 13R Design

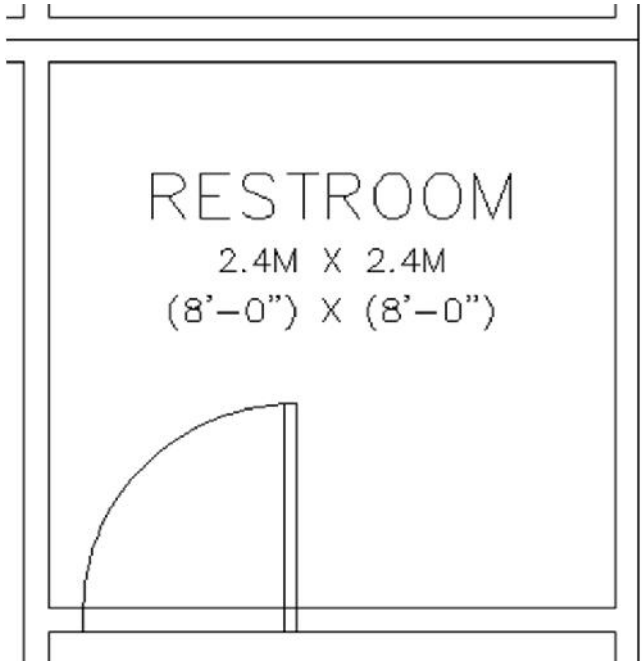
Now that we have determined which areas in the dwelling unit will require protection

- Sprinkler selection

- Best type of sprinkler for Restroom?

Viking Residential Pendent Sprinklers

VK468 – 70.6K (4.9)
VK470 – 43.2K (3.0)
VK430 – 62K (4.3)
VK488 – 43.2K (3.0)



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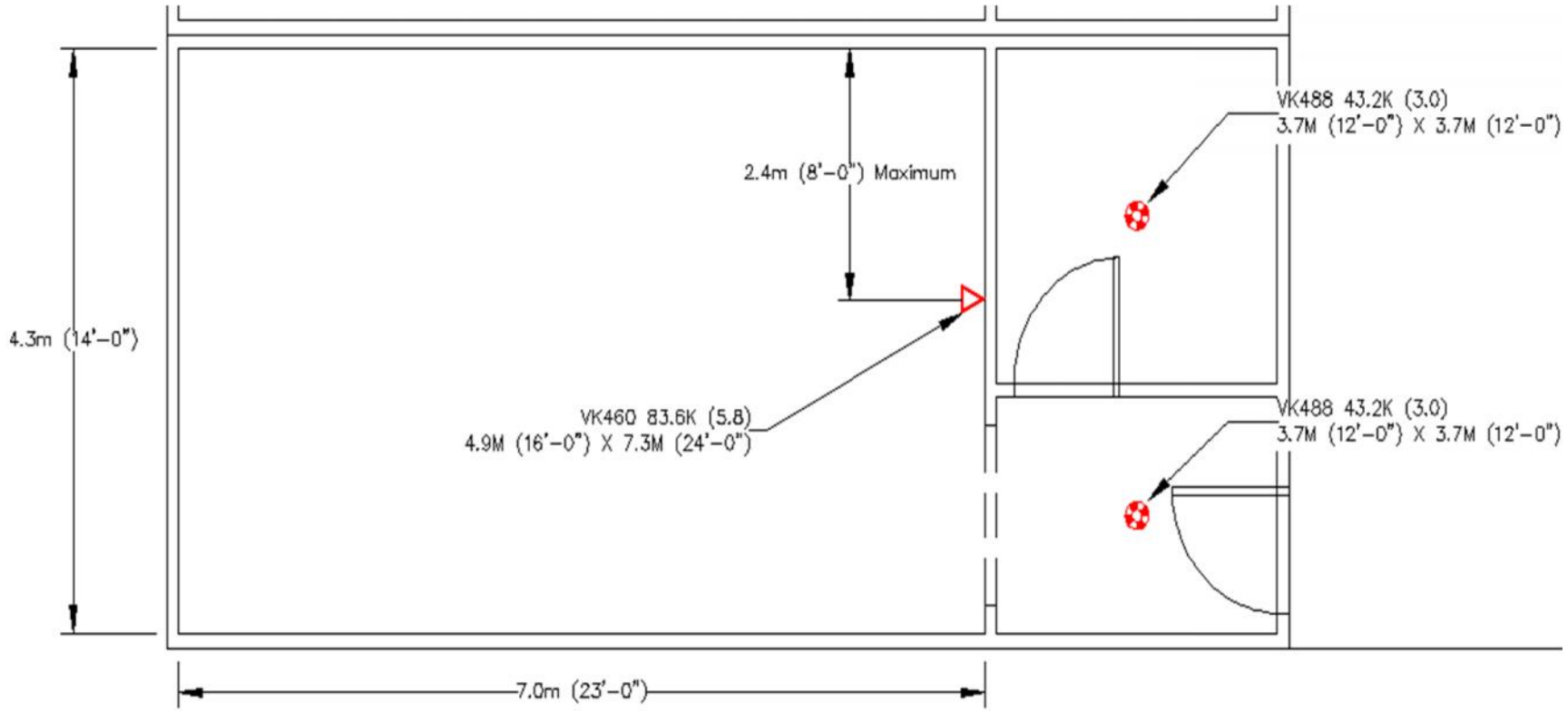
NFPA 13R Design and Calculations

NFPA 13R Design

Dwelling unit sprinkler layout



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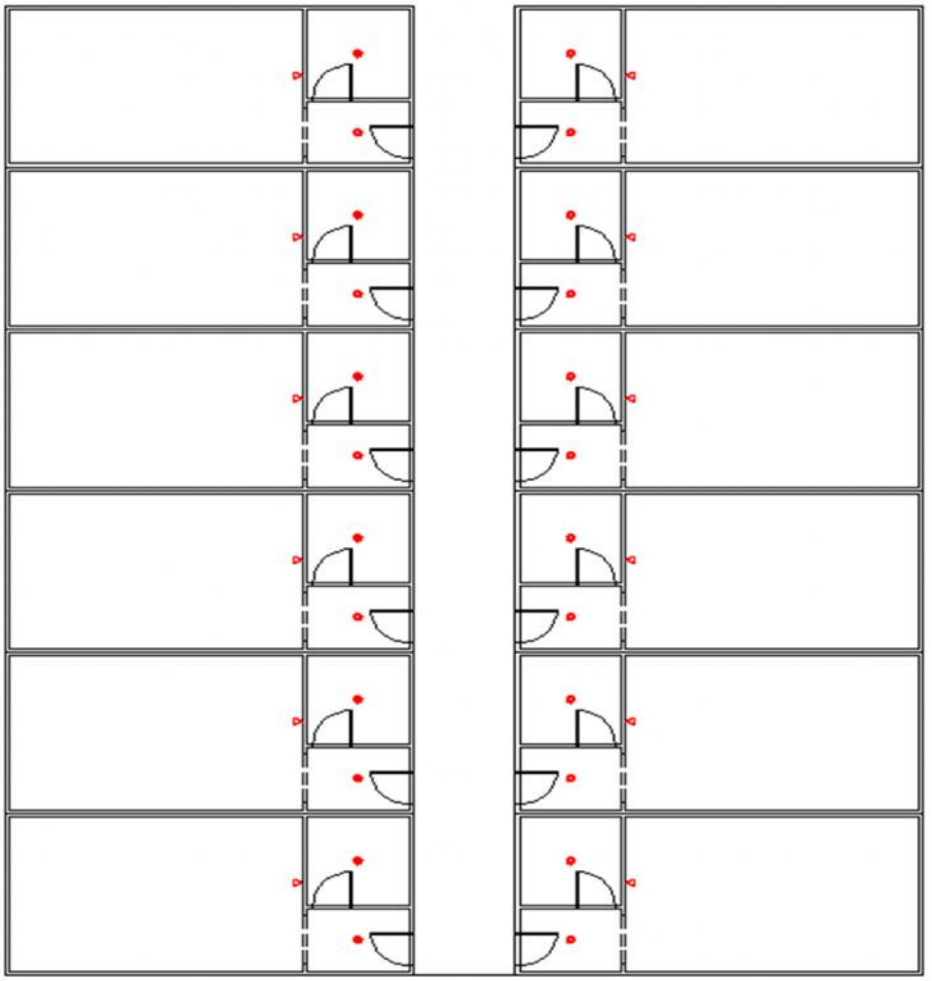
NFPA 13R Design

Dwelling unit sprinkler layout

- All Dwelling Units are similar
- Other protected areas?



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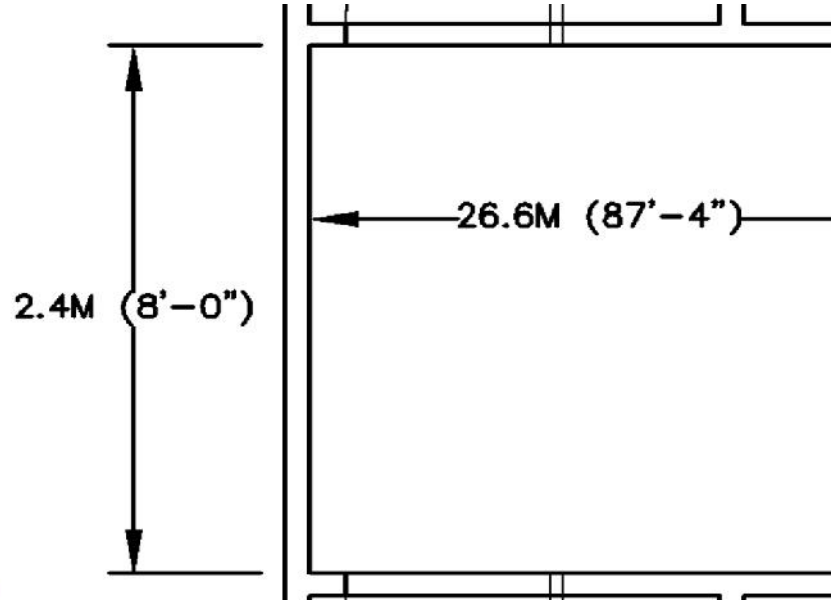
NFPA 13R Design

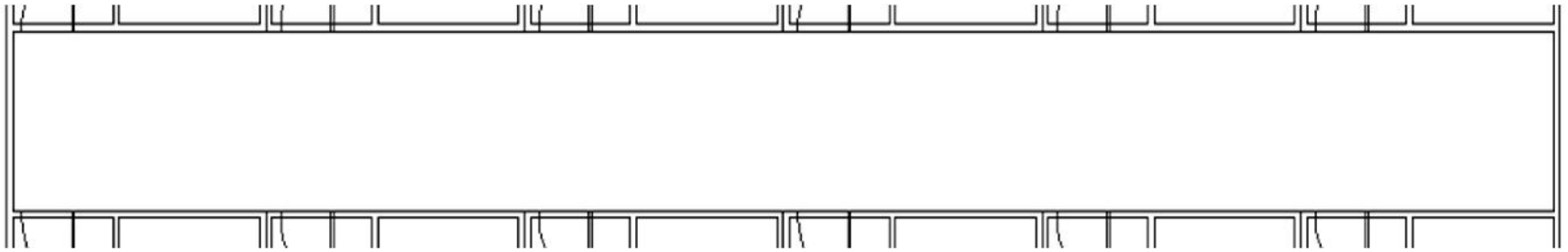
Corridor sprinkler layout

- Sprinklers outside dwelling unit shall be Quick response

- Where quick response sprinklers, including extended coverage, density is 4.1mm/min

- Extended coverage – flow to meet listing





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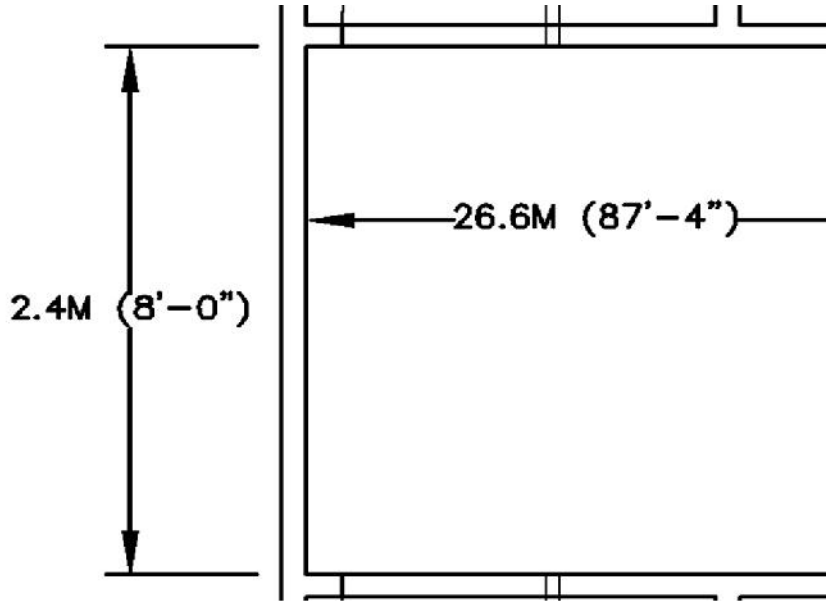
Corridor sprinkler layout

- Maximum coverage area of any sprinkler is 36 sq. meters
- Extended coverage pendent sprinklers – 6.1m x 6.1m
- 26.6m /6.1m = 4.36
- 5 Sprinklers



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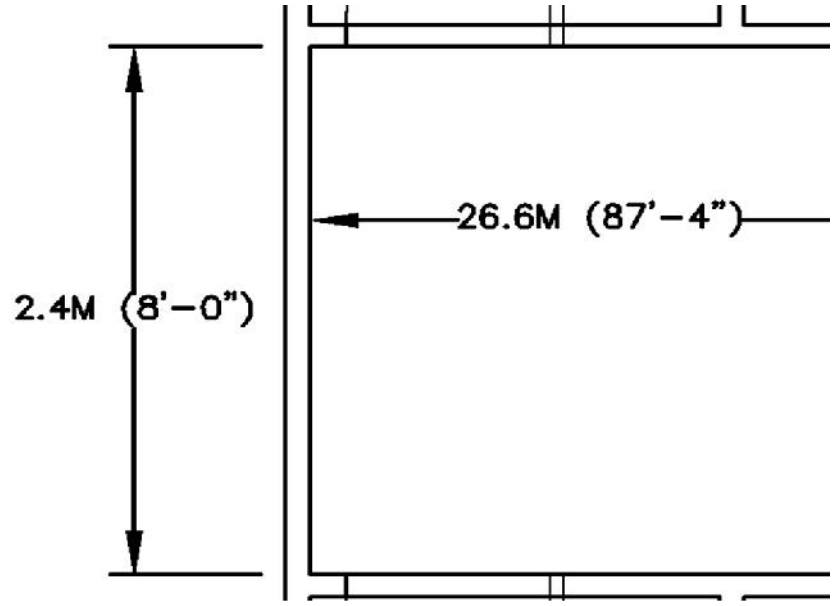
NFPA 13R Design

Corridor sprinkler layout

- The number of design sprinklers for a corridor or breezeway outside the dwelling unit.
- – up to 4 sprinklers.
- Is there an option?



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NFPA 13R Design and Calculations

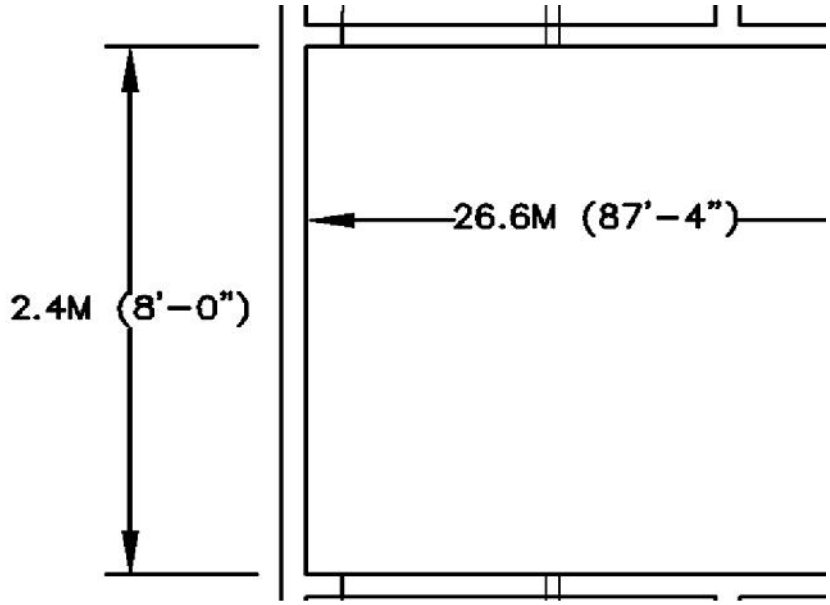
NFPA 13R Design

Corridor sprinkler layout

VK638 Corridor Sprinkler
- 8.5m (28’-0”) x 3.7m (12’-0”)

- 26.6m (87’-4”)/8.5m (28’-0”) = 3.2

- 4 sprinklers



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NFPA 13R Design and Calculations

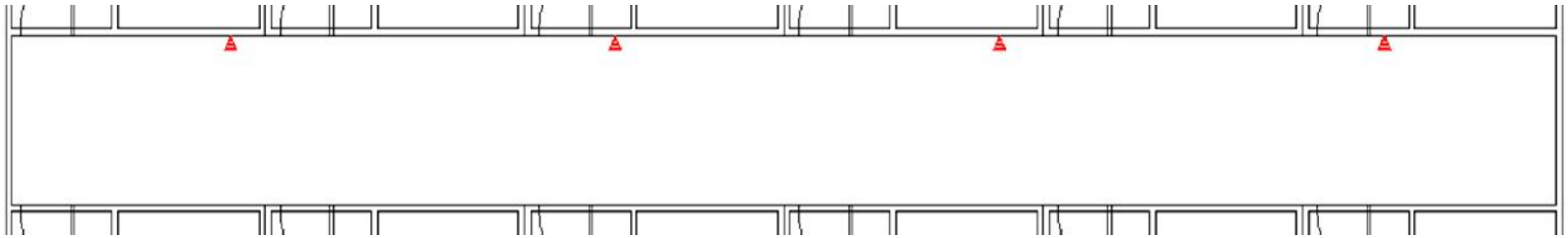
NFPA 13R Design

Corridor sprinkler layout

VK638 Corridor Sprinkler

- 8.5m x 3.7m

- 128.7lpm @ 1.24bar



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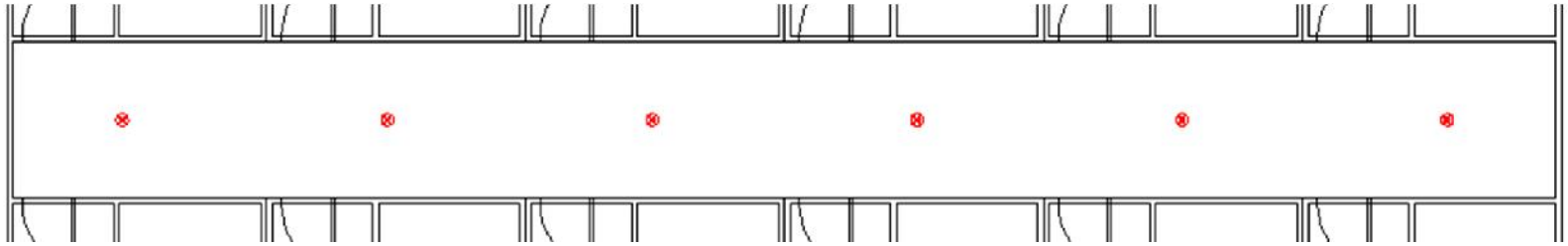
NFPA 13R Design and Calculations

NFPA 13R Design

Corridor sprinkler layout

VK302 – Quick Response Standard coverage pendent sprinkler 80.6K (5.6)

- Maximum of 4 sprinklers



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NFPA 13R Design and Calculations

NFPA 13R Design

Corridor sprinkler layout

VK302 – Quick Response Standard coverage pendent sprinkler 80.6K

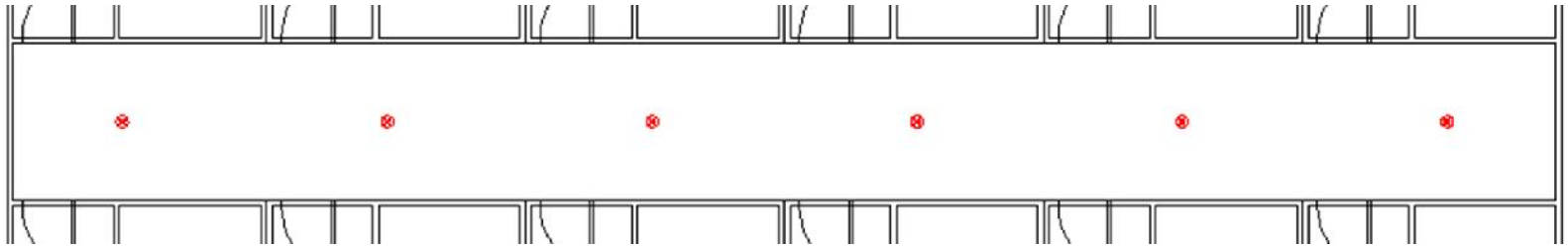
- Coverage area = 4.6m x 2.4m = 11 sq. meters

- 11 sq. meters * 4.08mm/min = 46 lpm

- (46lpm / 80.6 K)^{2} = .33bar

- Minimum pressure = .5bar

- 80.6K * .5 bar$^{1/2}$ = 57lpm



NFPA 13R Design and Calculations

NFPA 13R Design

Corridor sprinkler layout

- Layout options determined
- Which sprinklers will be included in the calculations?

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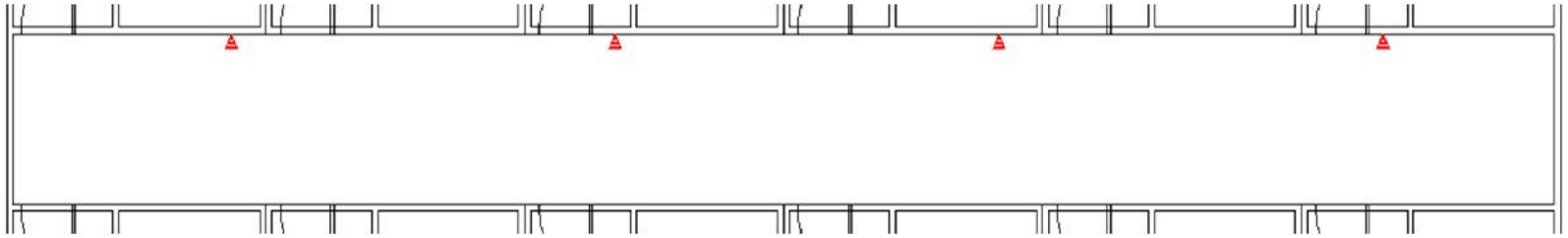
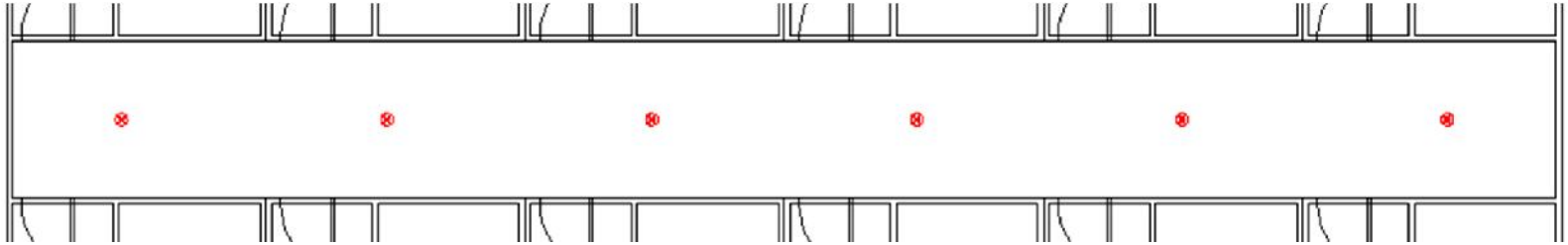
NFPA 13R Design and Calculations

NFPA 13R Design

- VK638 - 128.7lpm * 4 = 515lpm



- VK302 - 57lpm * 4 = 228lpm



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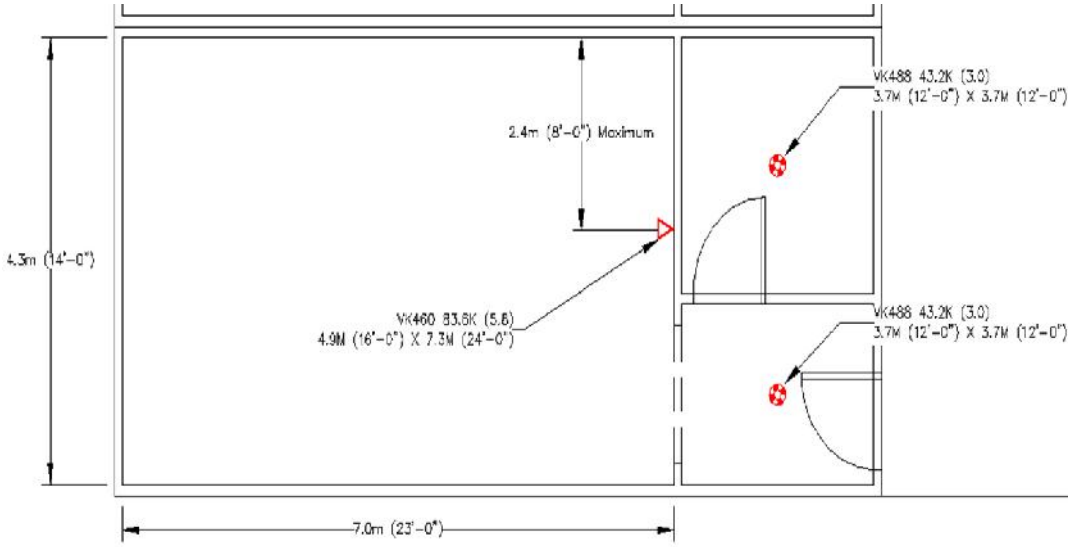
NFPA 13R Design and Calculations

NFPA 13R Design

- Up to 4 sprinklers within a compartment
- Restroom – VK488 - 3.7m X 3.7m
- 30.3lpm @ .49bar
- Only sprinkler in the compartment



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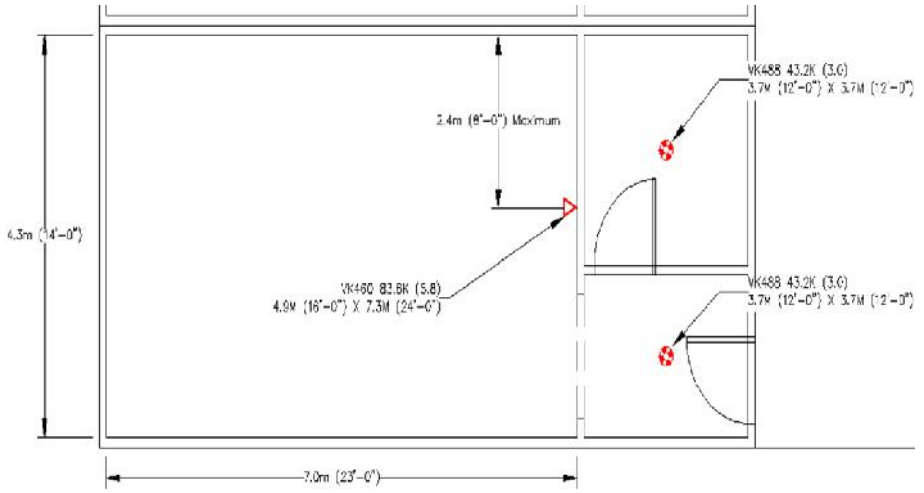
NFPA 13R Design and Calculations

NFPA 13R Design

- Up to 4 sprinklers within a compartment

- Is the entry and hotel room the same compartment?

- Compartment
  - Completely enclosed by ceiling and walls
  - Walls permitted to have openings
  - Minimum lintel depth 203mm
  - Width does not exceed 2.44m



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NFPA 13R Design and Calculations

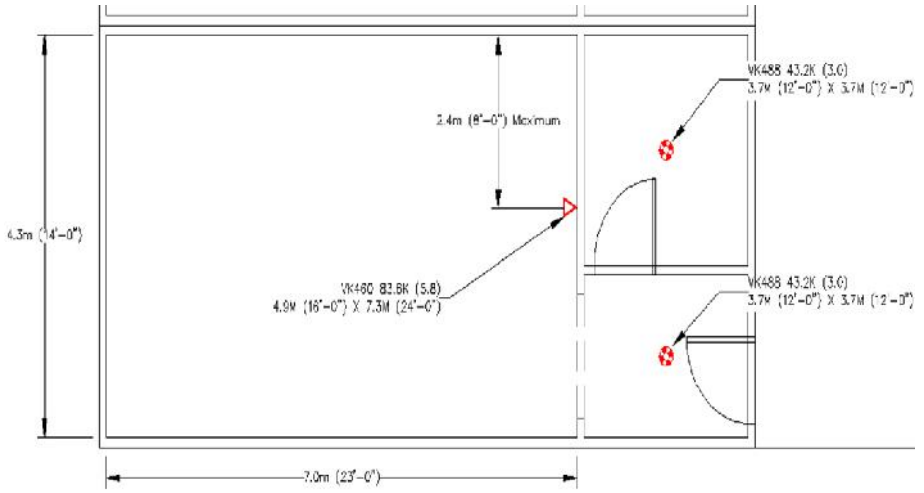
NFPA 13R Design

- Up to 4 sprinklers within a compartment

- Is the entry and hotel room the same compartment?

- Compartment
  - Completely enclosed by ceiling and walls
  - Walls permitted to have openings
  - Minimum lintel depth 203mm
  - Width does not exceed 2.44m

- They would be separate compartments



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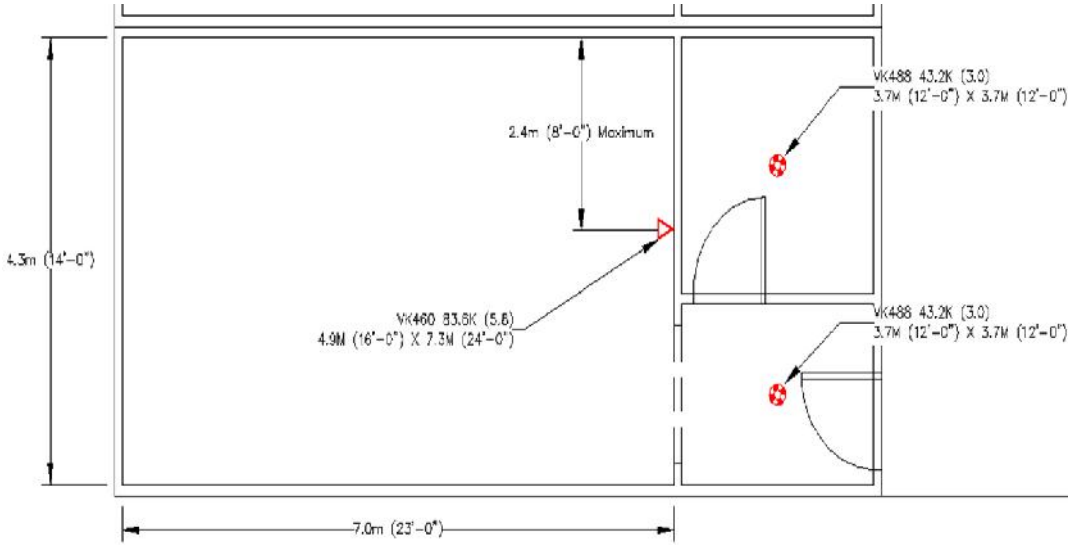
NFPA 13R Design and Calculations

NFPA 13R Design

- Up to 4 sprinklers within a compartment
- Entry – VK488 - 3.7m X 3.7m
- 30.3lpm @ .49bar
- Only sprinkler in the compartment



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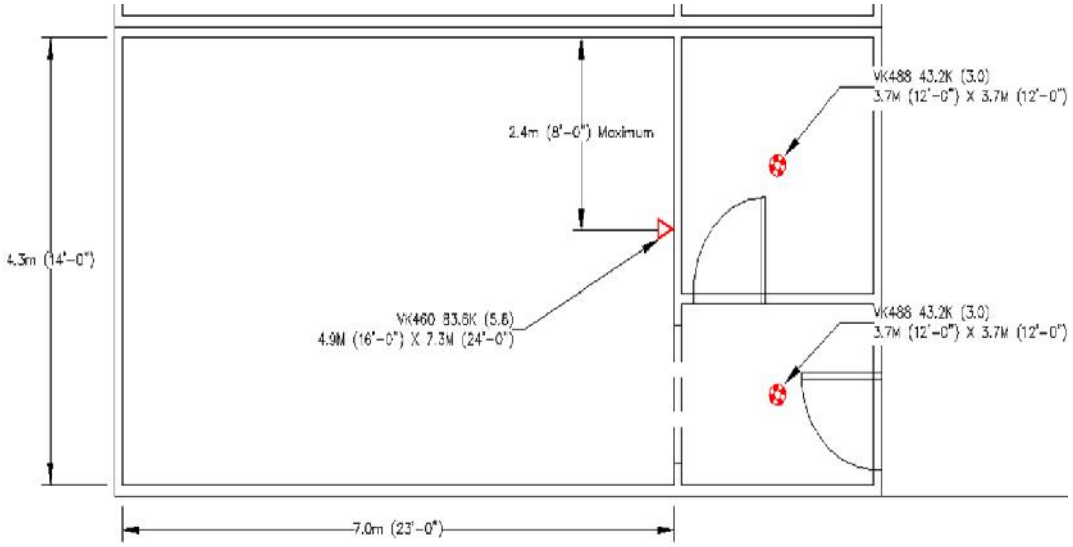
NFPA 13R Design and Calculations

NFPA 13R Design

- Up to 4 sprinklers within a compartment
- Hotel Room – VK460 - 4.9m X 7.3m
- 143.8lpm @ 2.96bar
- Only sprinkler in the compartment



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NFPA 13R Design and Calculations

NFPA 13R Design

Comparing our design options between the areas to select the most hydraulically demanding

Corridor Options

- VK638 - 128.7lpm* 4 = 515lpm @ 1.24bar
- VK302 - 57lpm * 4 = 228lpm @ .49bar

Guest Room

- Restroom/Entry – VK488 - 30.3lpm @ .49bar
- Hotel Room – VK460 - 143.8lpm @ 2.96bar

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NFPA 13R Design and Calculations

NFPA 13R Design

Comparing our design options between the areas to select the most hydraulically demanding

Corridor Options

- VK638 - 128.7lpm * 4 = 515lpm (136 gpm) @ 1.24bar
- VK302 - 57lpm * 4 = 228lpm @ .49bar

Guest Room

- Restroom/Entry – VK488 - 30.3lpm @ .49bar
- Hotel Room – VK460 - 143.8lpm @ 2.96bar

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NFPA 13R Design and Calculations

NFPA 13R Design

Option 1 – Design includes VK302 pendent sprinklers in corridor.

Corridor Options

- VK302 - 57lpm * 4 = 228lpm @ .49bar

Guest Room

- Hotel Room – VK460 - 143.8lpm @ 2.96bar

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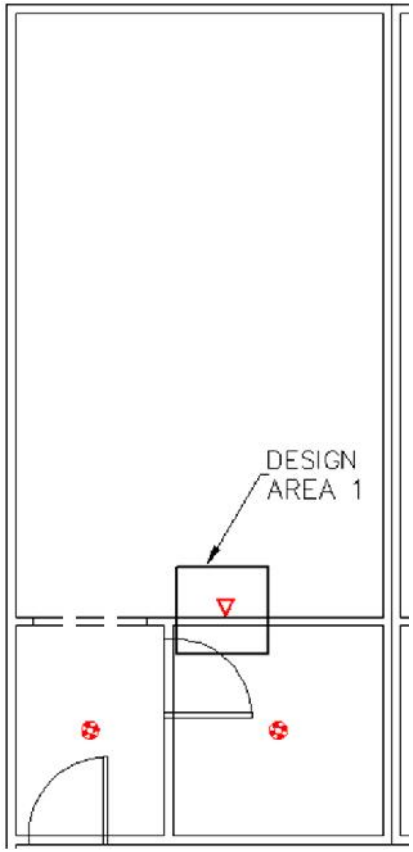
NFPA 13R Design and Calculations

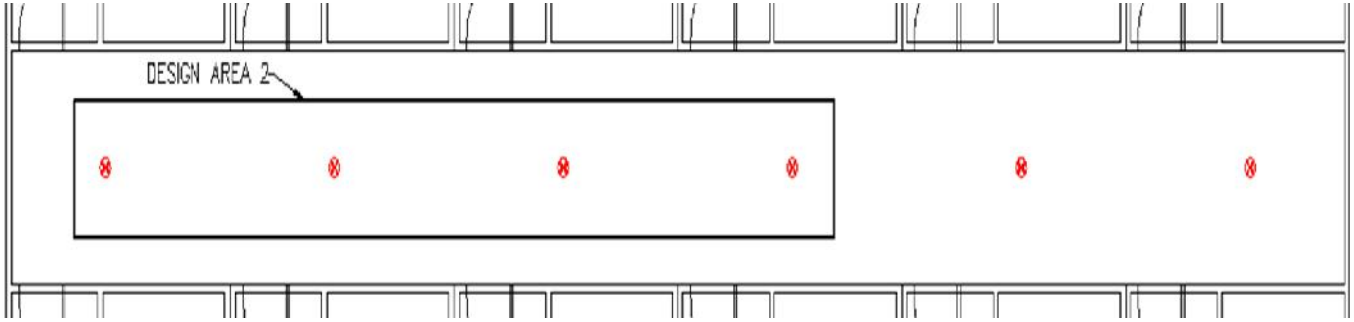
NFPA 13R Design

Option 1

Hotel Room Design Area 1 – Most demanding for pressure

Corridor Design Area 2 – Most demanding for flow





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NFPA 13R Design and Calculations

NFPA 13R Design

Option 2 – Design includes VK638 sidewall sprinklers in corridor.

Corridor Options

- VK638 - 128.7lpm * 4 = 515lpm @ 1.24bar

Guest Room

- Hotel Room – VK460 - 143.8lpm @ 2.96bar

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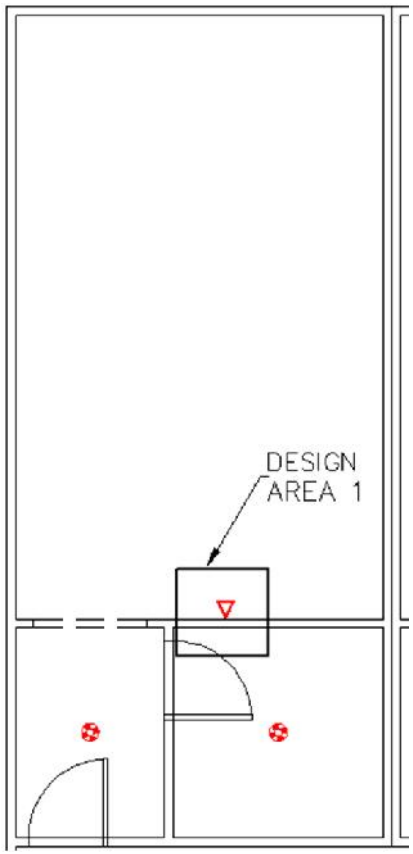
NFPA 13R Design and Calculations

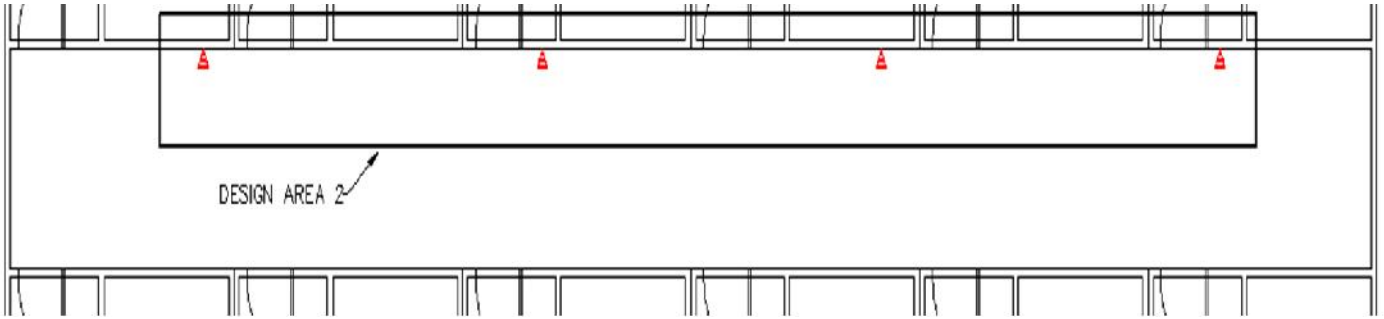
NFPA 13R Design

Option 2

Hotel Room Design Area 1 – Most demanding for pressure

Corridor Design Area 2 – Most demanding for flow





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NFPA 13 Design and Calculations

NFPA 13 Design

NFPA 13 – The Standard for the Installation of Sprinkler Systems

NFPA 13 – (4) Residential Sprinklers at a minimum 4.08 mm/min or residential listing, which ever is greater

- 30 minute water supply

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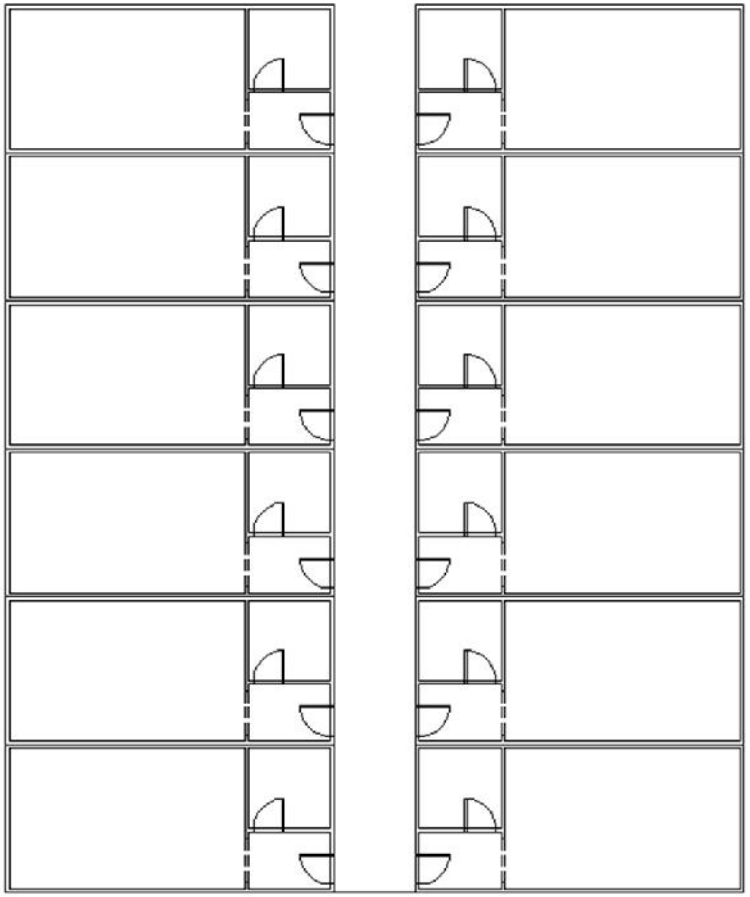
NFPA 13 Design and Calculations

NFPA 13 Design

-High Rise Hotel Room Layout

- 10th Floor (10 stories)

- Water supply location



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NFPA 13 Design

Which areas of the room will require protection?

For this example, we determined that as per NFPA 13R all areas were going to be protected.

Same will apply for NFPA 13 for all areas being protected.

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NFPA 13 Design and Calculations

NFPA 13 Design

Where can Residential sprinklers be used?

- Residential sprinklers permitted in dwelling units and adjoining corridors, provided they are installed in accordance with their listing

- The design area shall be the area that includes the four adjacent sprinklers that produce the greatest hydraulic demand

- The minimum discharge shall be the greater of the following:
    - In accordance with the minimum flow rates indicated in listings
    - Calculated based on a 4.08mm/min over the design area
        - A = S X L
        - Small Room rule – 74.3 sq. meters area of room divided by number of sprinklers in room

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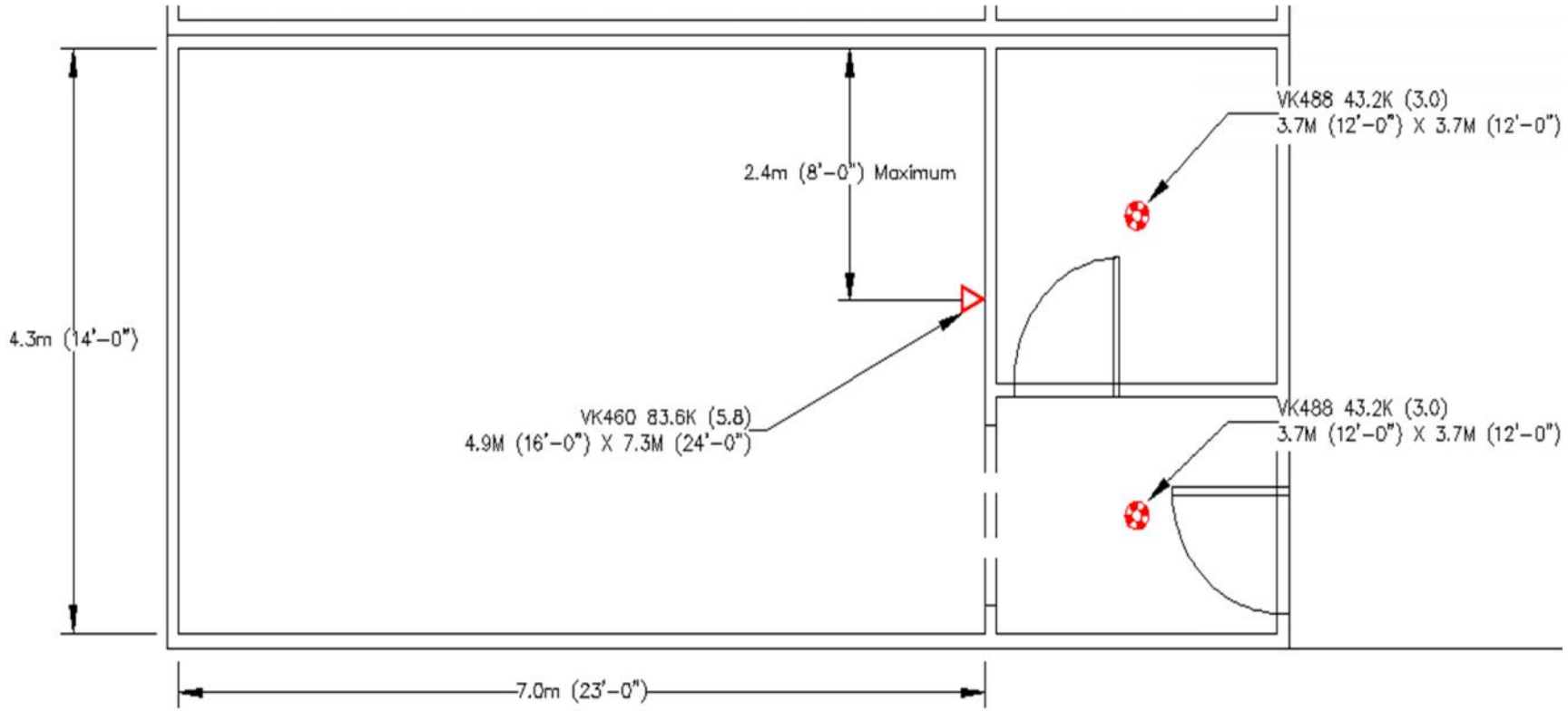
NFPA 13 Design and Calculations

NFPA 13 Design

Dwelling unit sprinkler layout



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NFPA 13 Design and Calculations

NFPA 13 Design

Entry – VK488

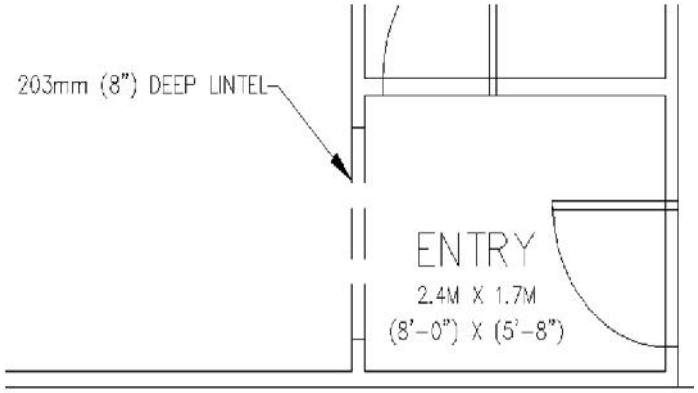
Approval Chart per listing
3.7m X 3.7m = 30.3lpm @ .49bar

Actual design area at 4.08mm/min

2.4m x 1.7m = 4.08 sq. meters

Demand based on minimum operating pressure =
30 lpm @ .48 bar

- Approval chart listing will be used.



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NFPA 13 Design and Calculations

NFPA 13 Design

Restroom – VK488

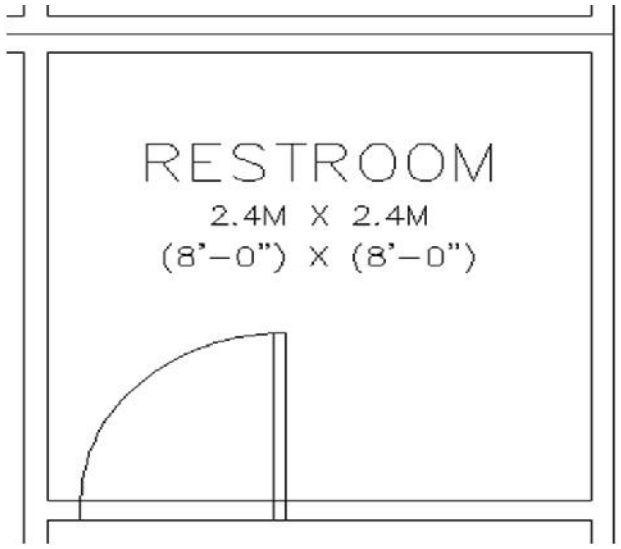
Approval Chart per listing
3.7m X 3.7m = 30.3lpm @ .49bar

Actual design area at 4.08 mm/min

2.4m x 2.4m = 5.8 sq. meters

Demand based on minimum operating pressure =
30lpm @ .48 bar

- Approval chart listing will be used.



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NFPA 13 Design and Calculations

NFPA 13 Design

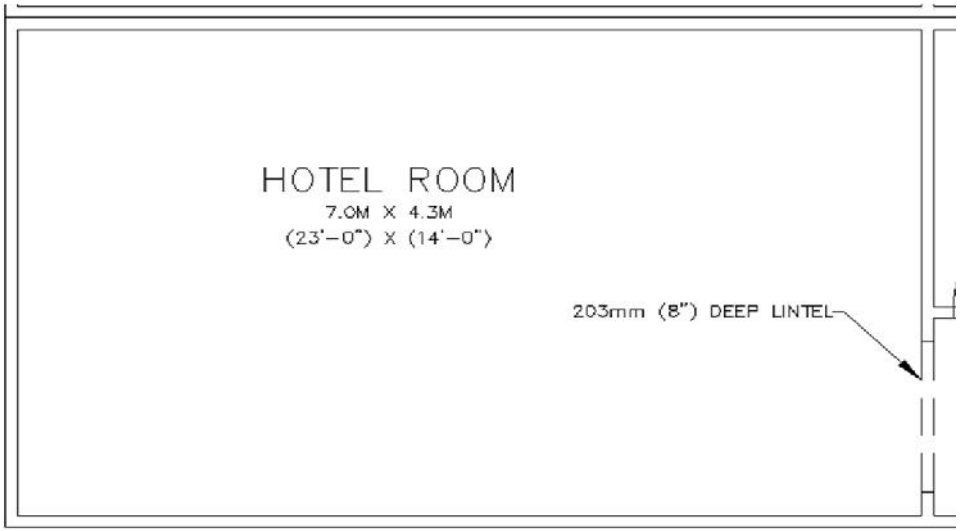
Hotel Room – VK460

Approval Chart per listing
4.9m X 7.3m = 143.8lpm @ 2.96bar

Actual design area at 4.08 mm/min

4.3m x 7.0m = 30.1 sq. meters

30.1 sq.meters * 4.08 mm/in = 123.4lpm



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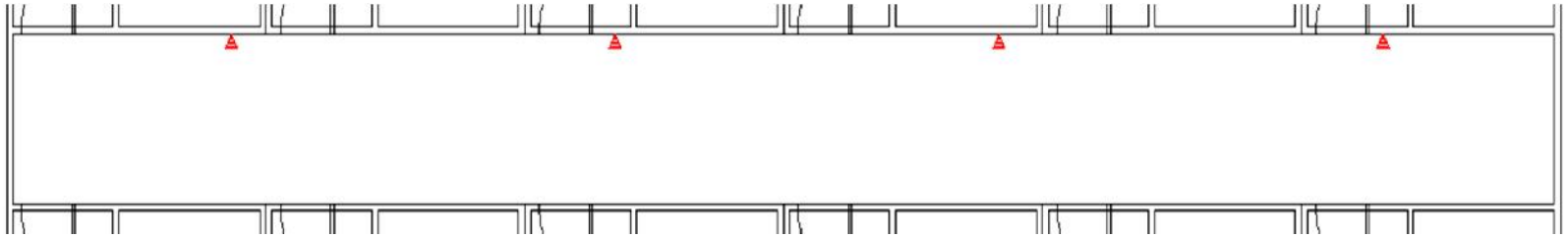
NFPA 13 Design and Calculations

NFPA 13 Design

- In this example the VK638 was selected.
- Water supply is greater.
- VK638 - 128.7lpm @ 1.24bar



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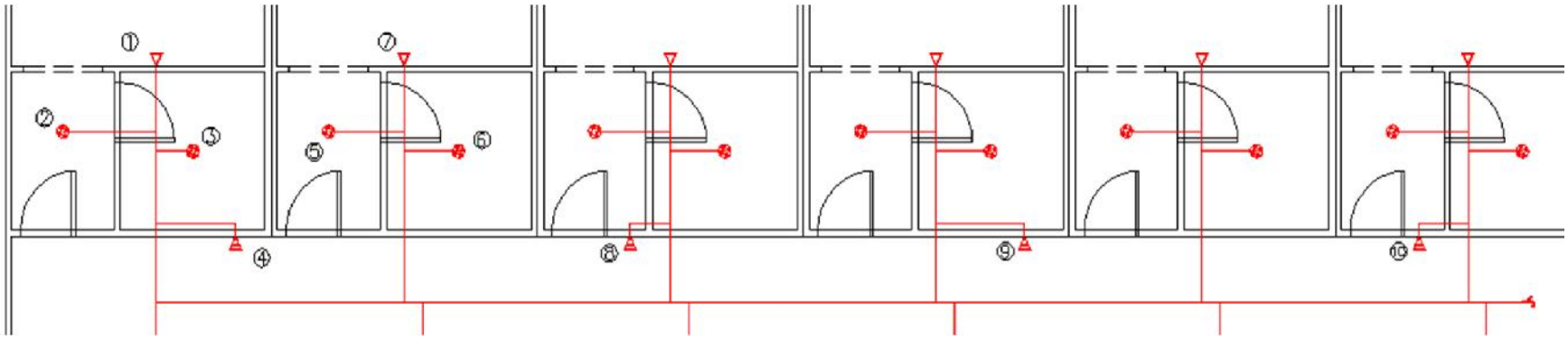
NFPA 13 Design and Calculations

NFPA 13 Design

- Selecting the design area
- 4 most demanding adjacent sprinklers



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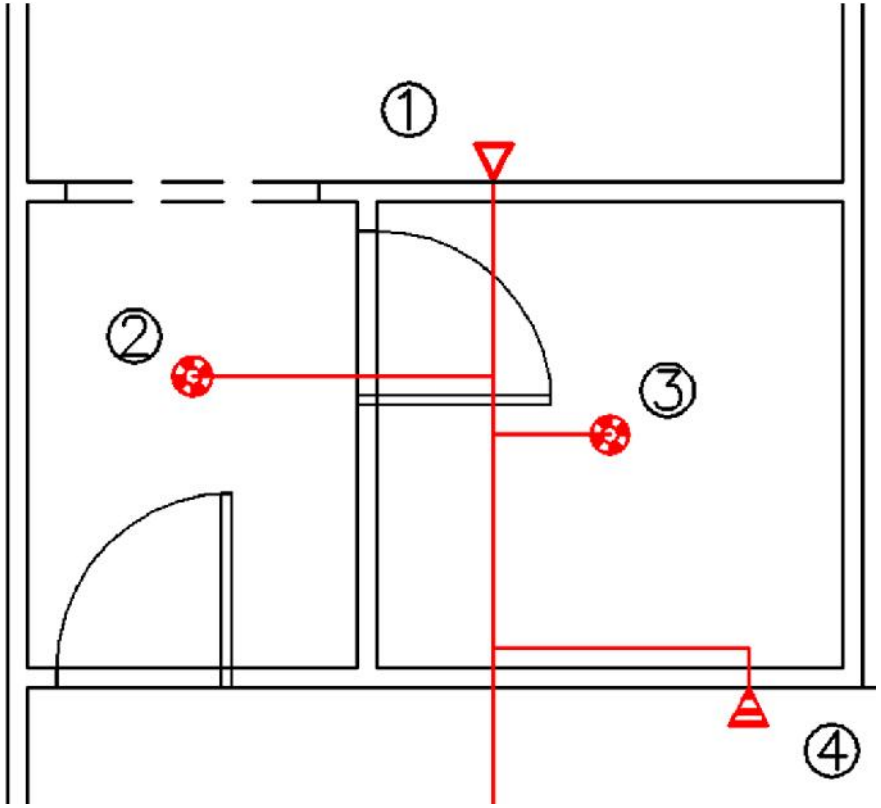
NFPA 13 Design

- Examine possible options for most demanding sprinklers

- 1, 2, 3, and 4



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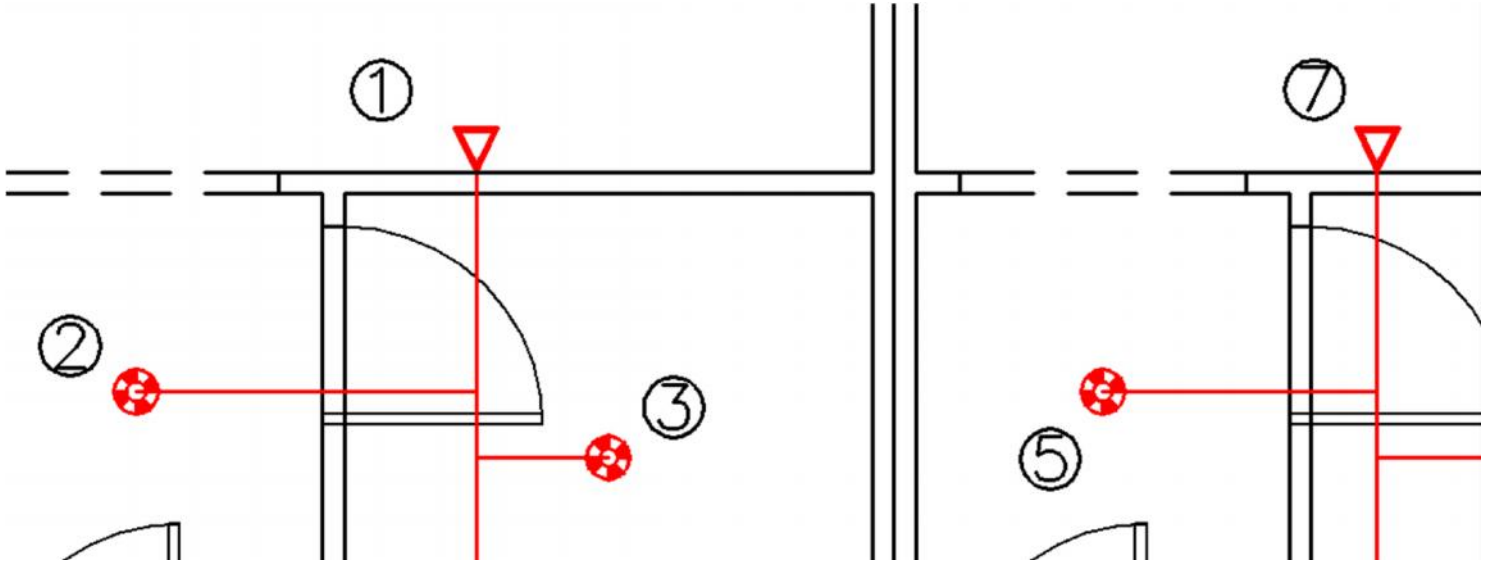
NFPA 13 Design and Calculations

NFPA 13 Design

- Examine possible options for most demanding sprinklers
- 1,2,3, and 7



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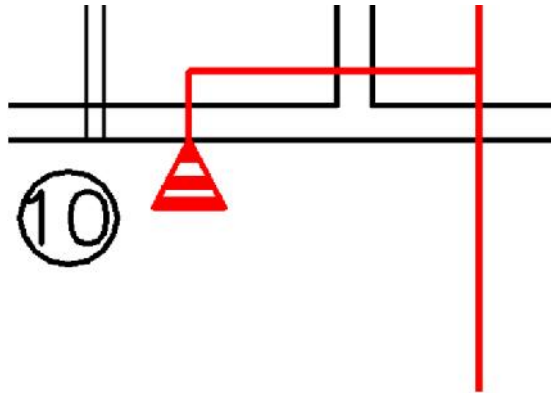
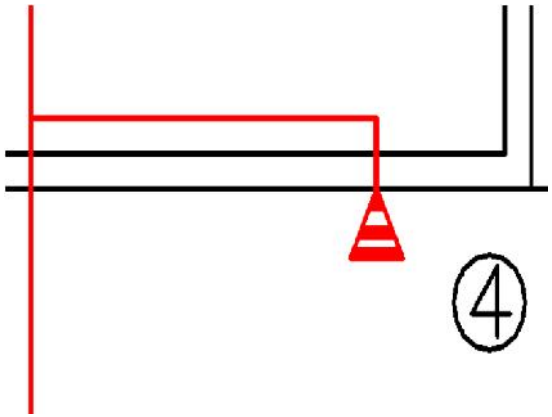
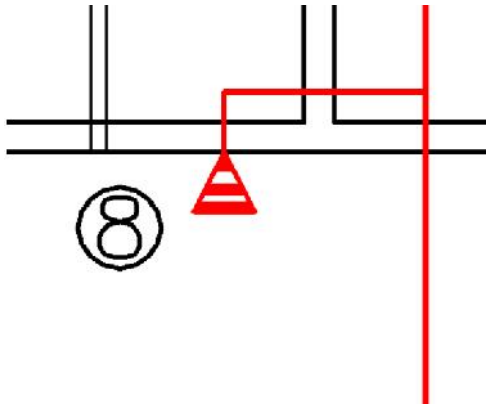
NFPA 13 Design and Calculations

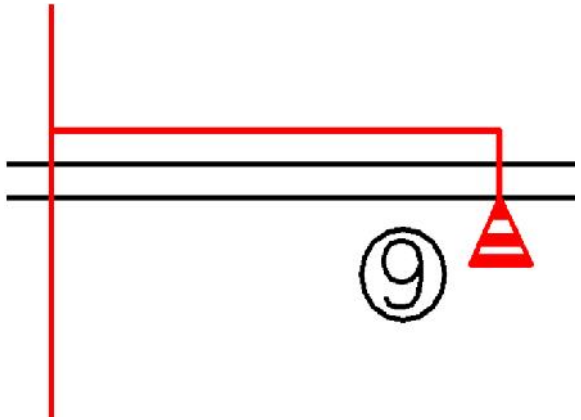
NFPA 13 Design

- Examine possible options for most demanding sprinklers
- 4,8,9, and 10









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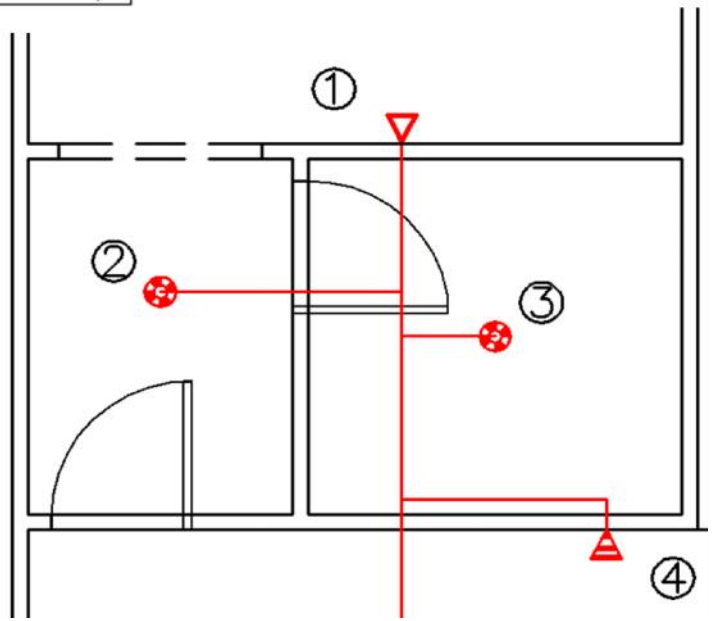
NFPA 13 Design and Calculations

NFPA 13 Design

NODE	SIN	FLOW	PRESSURE
1	VK460	143.8LPM (38GPM)	2.96BAR (42.9PSI)
2	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
3	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
4	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
TOTAL DEMAND = 492LPM (129.6GPM) @ 3.1BAR (44.5PSI)			

143.8 + 30.3 + 30.3 +128.7 lpm = 333.1 lpm

Why does the total demand show 492 lpm?



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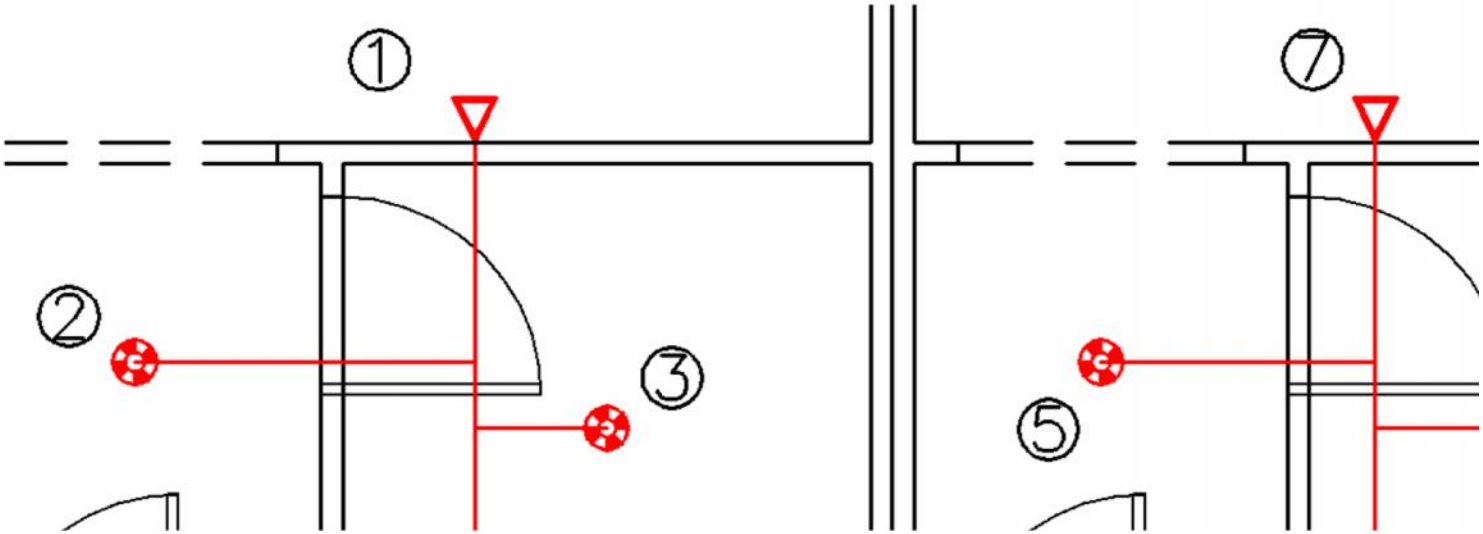
NFPA 13 Design and Calculations

NFPA 13 Design

NODE	SIN	FLOW	PRESSURE
1	VK460	143.8LPM (38GPM)	2.96BAR (42.9PSI)
2	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
3	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
7	VK460	143.8LPM (38GPM)	2.96BAR (42.9PSI)
TOTAL DEMAND = 444LPM (117GPM) @ 3.2BAR (45.2PSI)			



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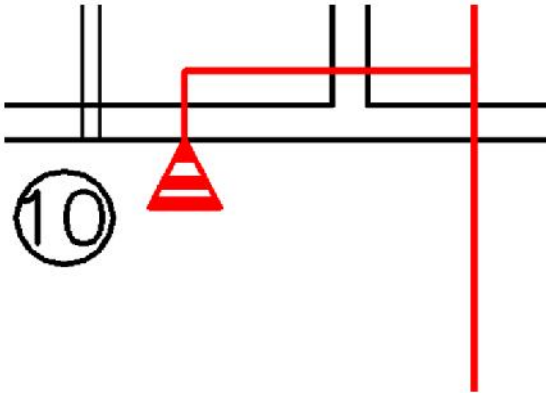
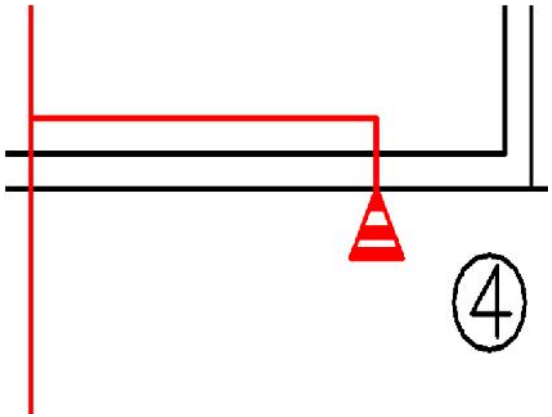
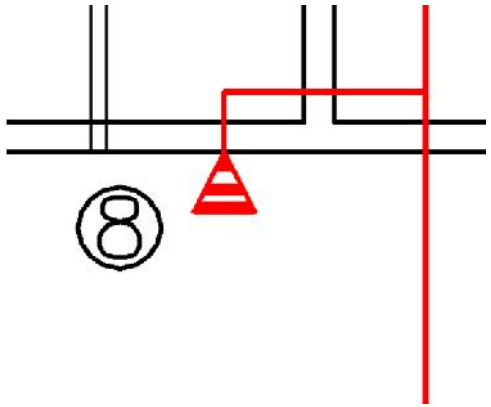
NFPA 13 Design and Calculations

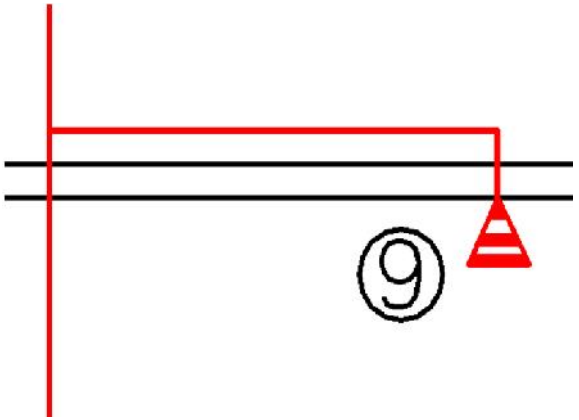
NFPA 13 Design

NODE	SIN	FLOW	PRESSURE
1	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
2	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
3	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
7	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
TOTAL DEMAND = 546LPM (144GPM) @ 1.6BAR (23PSI)			









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NFPA 13 Design and Calculations

NFPA 13 Design

NODE	SIN	FLOW	PRESSURE
1	VK460	143.8LPM (38GPM)	2.96BAR (42.9PSI)
2	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
3	VK488	30.3LPM (8GPM)	.49BAR (7.1PSI)
4	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
TOTAL DEMAND = 492LPM (129.6GPM) @ 3.1BAR (44.5PSI)			

NODE	SIN	FLOW	PRESSURE
1	VK460	143.8LPM (38GPM)	2.96BAR (42.9PSI)
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TOTAL DEMAND = 444LPM (117GPM) @ 3.2BAR (45.2PSI)			

NODE	SIN	FLOW	PRESSURE
1	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
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3	VK638	128.7LPM (34GPM)	1.24BAR (18.1PSI)
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TOTAL DEMAND = 546LPM (144GPM) @ 1.6BAR (23PSI)			

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Get in touch!

John-Erik Holmli

Tel.: +47 466 30 527
jholmli@vikingcorp.com

www.viking-emea.com