NSVCad Tools & NFPA Compliance

INSTALLATION RULES

YouTube

NSV
NSVSOFT.NET

Video Series Overview

NSVCad Tools & NFPA Compliance

NSVSOFT.NET

Video Series Overview

The intent of this presentation is to provide an overview of a series of instructional videos that explain important NFPA 13, 13R, and 13D sprinkler design topics. Each video focuses on a specific subject—such as the Sprinkler Placement methods, the Sketch-Based Method, Small Room Rule, Beam Rule, Soffit Rule, Three & Four Times Rules, Shadow Areas, Ceiling Pockets, Cloud Ceilings, Open Grid Ceilings, and Heat Source clearances.

Rather than going deep into technical details, the purpose here is to highlight what each video covers and how these rules and methods contribute to effective, code-compliant sprinkler system design. The videos also show the practical role of NSVCad software in applying these concepts—automating calculations, visualizing coverage, and identifying compliance issues.

This presentation will give a clear sense of the topics explored in the videos and how they connect to both NFPA requirements and real-world design practice.

Click the YouTube logo on each slide to watch its corresponding video.

VIDEO LINKS- NSVCad CHANNEL

- Sprinkler Placement: https://youtu.be/UCBRbfQ3-Ts
- Sketch-Based Method: https://youtu.be/W7Iowc12Z94
- Small Room Rule: https://youtu.be/tFE6p8a4In0
- Beam Rule: https://youtu.be/yG0zKyQsfXE
- Soffit Rule- Upright & Pendent sprinklers: https://youtu.be/GHM8C1jHoPA
- Soffit Rule- Sidewall sprinklers: https://youtu.be/9GE9OzeRnqI
- Three & Four Times Rules: https://youtu.be/KizRLXhoTQ0
- Shadow Area: https://youtu.be/DaTVYpgNgTQ
- Ceiling Pocket: https://youtu.be/-oGs3SogxUk
- Cloud Ceiling: https://youtu.be/T9Q7O4szK1Y
- Open Grid Ceiling: https://youtu.be/vohxa8ijQN8
- Heat Sources: https://youtu.be/tDng6R2opic

YouTube

NSV
NSVSOFT.NET

Sprinkler Placement

Sprinkler Placement

BRIEF OVERVIEW

NFPA 13 defines maximum coverage and spacing for each sprinkler type; designers apply these through layout methods. In this video, four placement strategies are demonstrated:

- First Method: Maximum Spacing Along the Length
- Second Method: Maximum Spacing Along the Width
- Third Method: Width Derived From the Length
- Fourth Method: Length Derived From the Width

NSVCad automates sprinkler layout by allowing users to input room corners, sprinkler type, spacing, and coverage area. It then generates optimal designs, displays spacing parameters, and auto-places sprinklers—sorted from lowest to highest head count—for efficient, NFPA-compliant coverage.

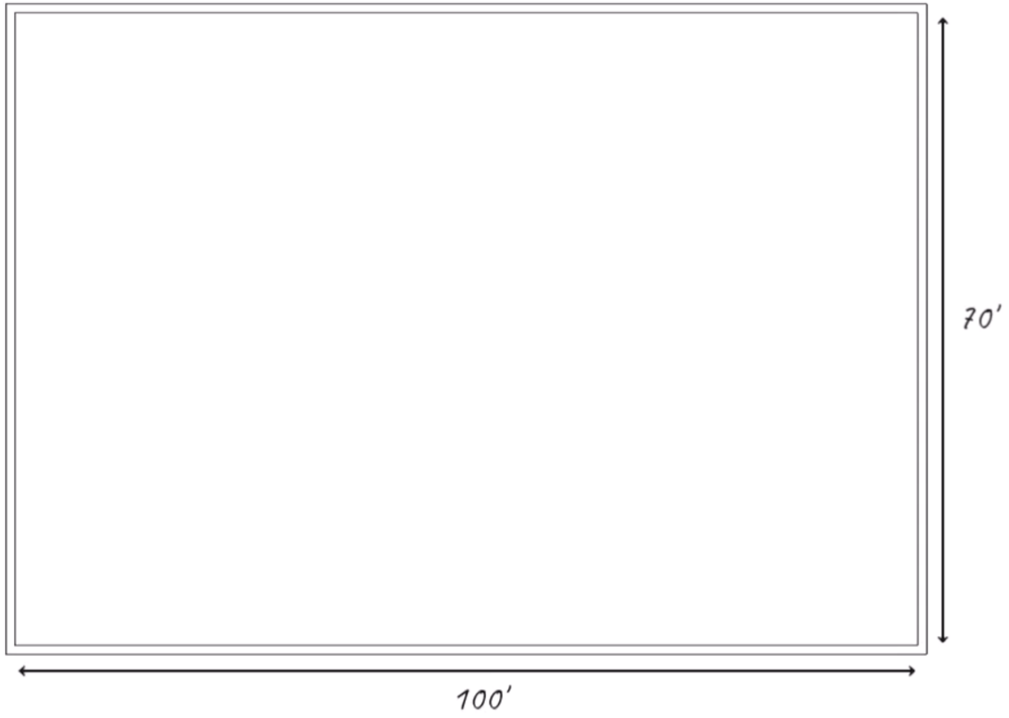
YouTube

NSVSOFT.NET

Calculating the Minimum Number of Sprinklers

Example:

- Dimension: 100 ft x 70 ft
- Ceiling: Flat and Horizontal
- Occupancy Hazard Classification: OH
- Sprinkler Type: Standard Spray
- Maximum Protection Area: 130 ft^2 - Per Table 10.2.4.2.1(b)
- Maximum Spacing: 15 ft - Per Table 10.2.4.2.1(b)



Room Area = 100 x 70 = 7000 ft^2

$$\text{Minimum Number of the required Sprinklers} = \frac{\text{Room Area}}{\text{Maximum Protection Area}} = \frac{7000}{130} = 53.8 \Rightarrow \textbf{54 Sprinklers}$$

Applying the 1st Method

Example:

Minimum Number of Sprinklers= 54

Maximum Spacing= 15 ft

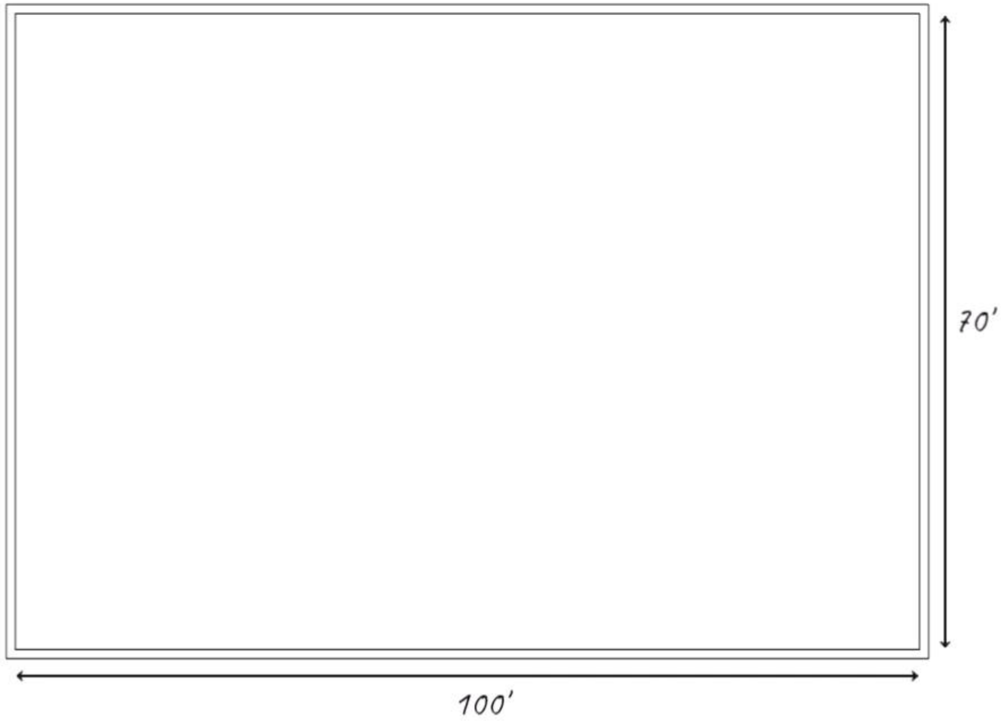
Number of the Sprinklers Along the Length= 7

Number of the Sprinklers Along the Width= 8

Total Number of the Sprinklers by the First Method = 7 × 8 =56

Spacing of Sprinklers Along the Length = 14.28 ft

Distance From the Wall Along the Length = 7.14 ft



$$\text{Spacing of Sprinklers Along the Width} = \frac{\text{Room Width}}{\text{Minimum Number of the Required Sprinklers Along the Width}} = \frac{70}{8} = 8.75 \text{ ft}$$

$$\text{Distance from the wall Along the Width} = \frac{\text{Spacing of Sprinklers Along the Width}}{2} = \frac{8.75}{2} = 4.375 \text{ ft}$$

Coverage Area of Sprinklers
‘S × L’ & Sketch-Based Methods

BRIEF OVERVIEW

The Sketch-Based Method

The video explains how to determine sprinkler coverage areas in line with NFPA 13. It begins with the NFPA-introduced S by L method:

- 'S' is the larger of the distance to the next sprinkler or twice the distance to a wall along the branch line;
- 'L' is the corresponding measure between branch lines.

Through examples, it calculates rectangular coverage areas (S × L).

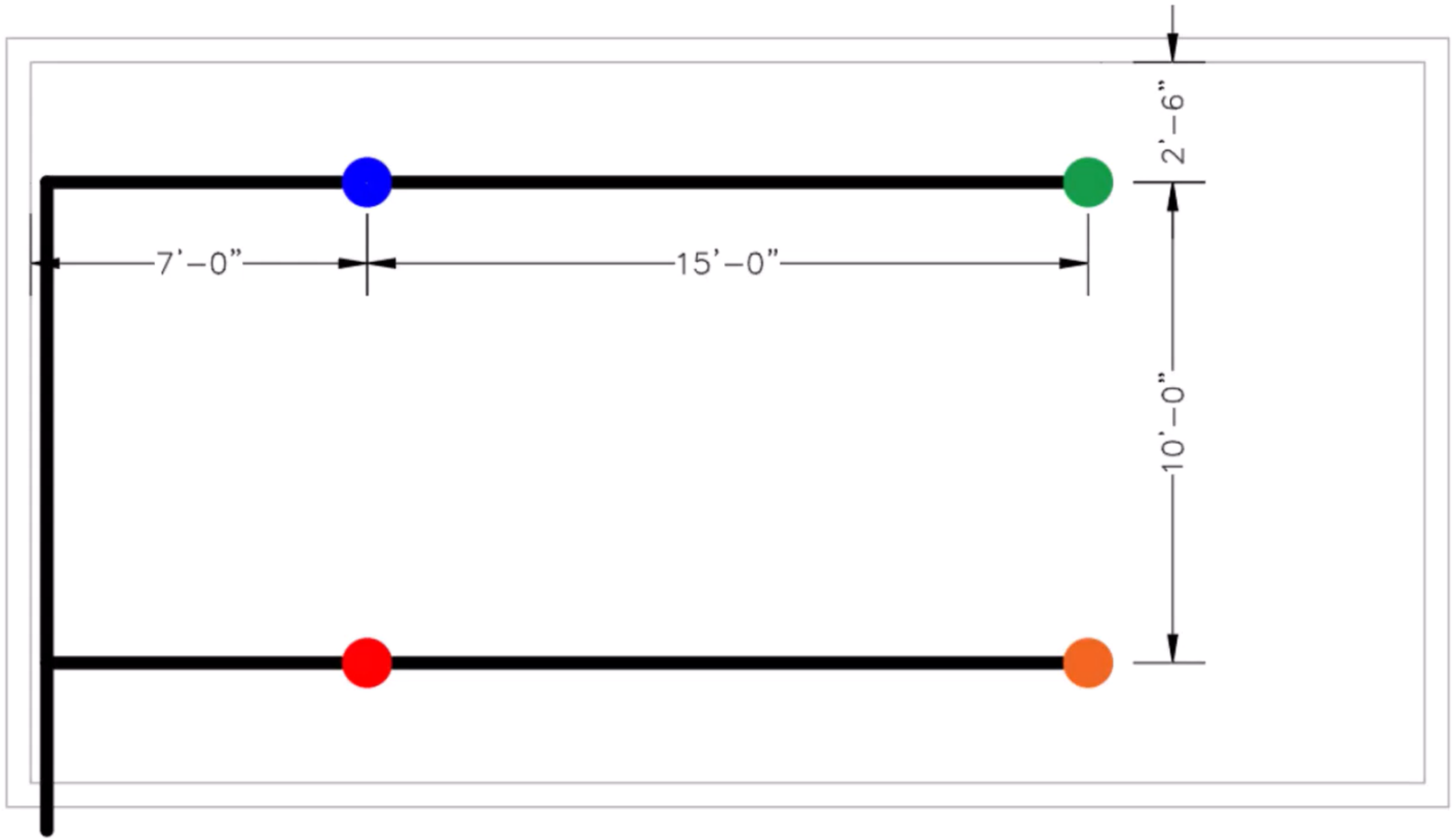
However, non-uniform spacing from obstructions or heat-source clearances can make 'S × L' less straightforward. The video presents the creative Sketch-Based Method. Three examples—from uniform to highly irregular spacing—illustrate the method, culminating in software automation.

NSVCad instantly applies this approach, calculating S, L, and area, and flagging non-compliance.

YouTube

NSVSOFT.NET

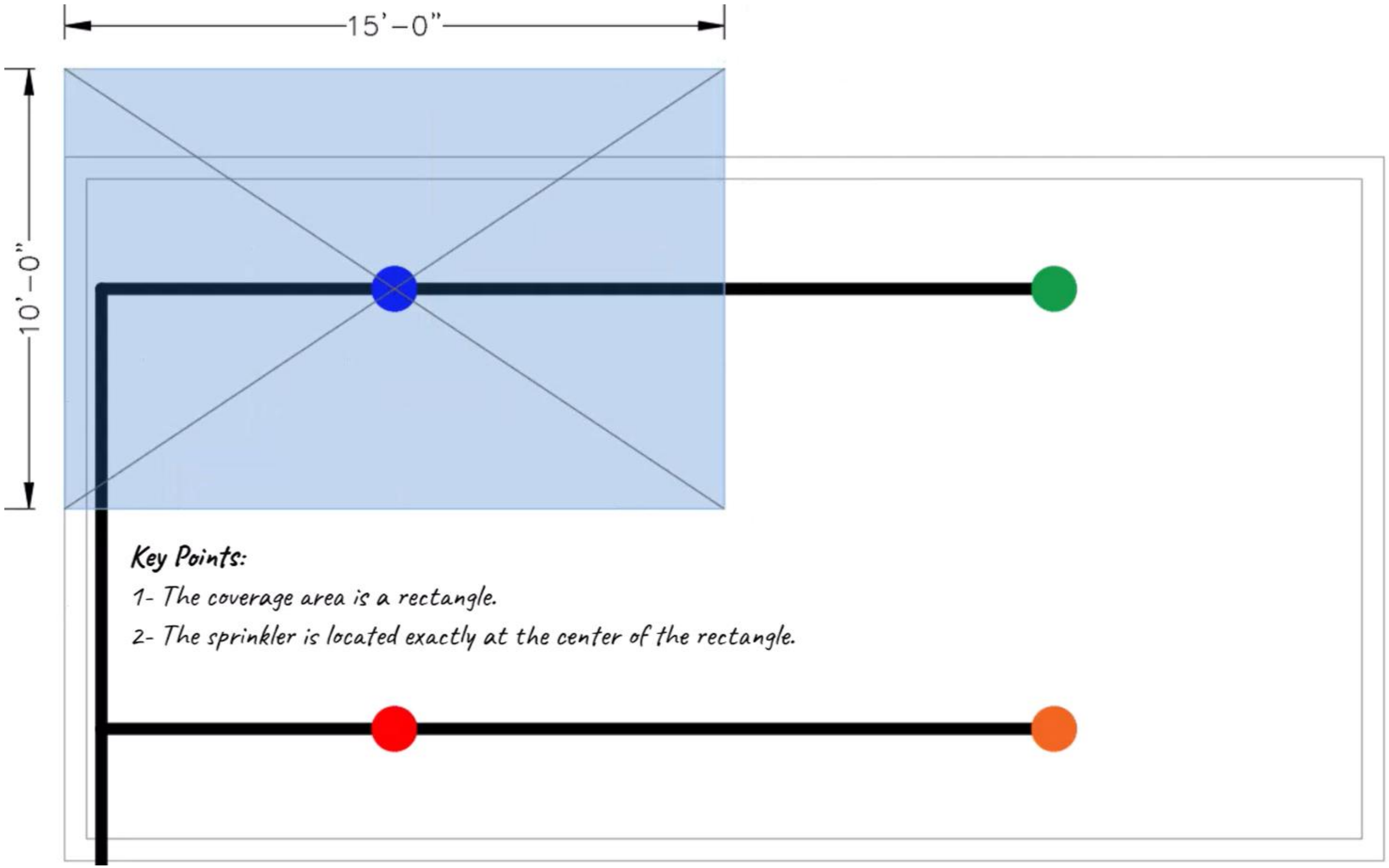
Finding 'S' and 'L'



YouTube

NSVSOFT.NET

Key Points

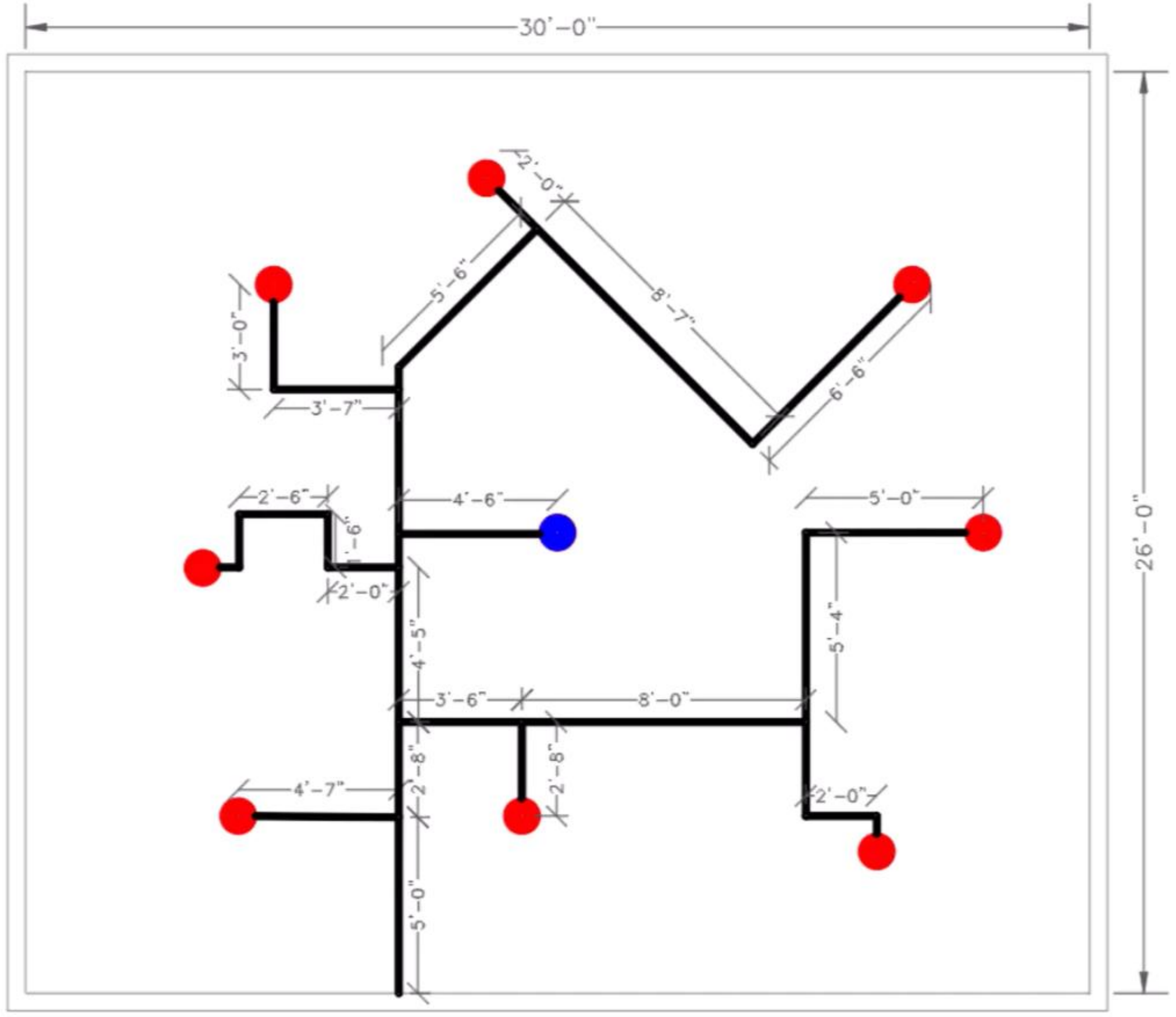


S x L METHOD

YouTube

NSV
NSVSOFT.NET

Finding the Coverage Area of the Blue Sprinkler



SKETCH BASED METHOD

YouTube

NSVSOFT.NET

Small Room Rule

Small Room Rule

BRIEF OVERVIEW

The small room rule in NFPA 13 allows standard spray upright and pendant sprinklers to be placed up to 9 ft from one wall—beyond the usual half-spacing limit—when specific conditions are met.

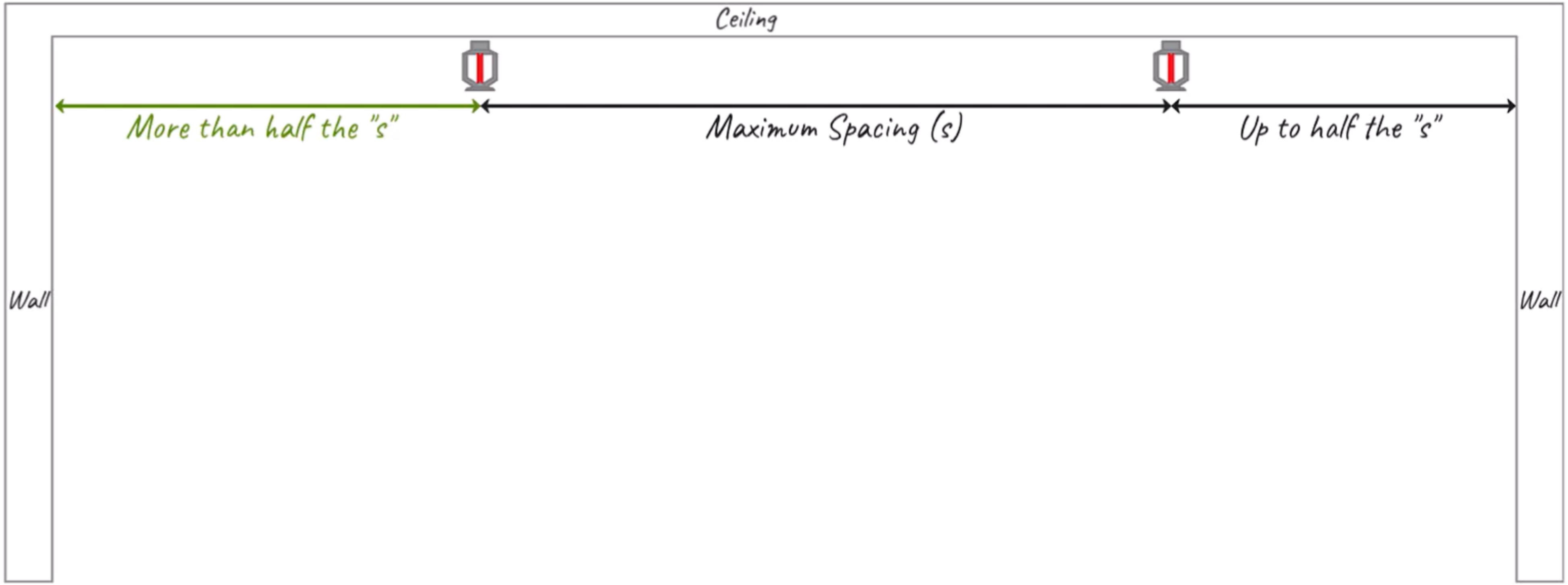
In this video, we explore the “small room rule” and its impact on sprinkler system design. We define what qualifies as a small room and explain the compartment criteria, including wall openings and lintel requirements. We demonstrate how coverage is calculated based on room area per sprinkler, rather than the typical S-by-L method.

NSVCad streamlines compliance by automatically verifying layout parameters, ensuring alignment with NFPA standards and promoting efficient, code-compliant design.

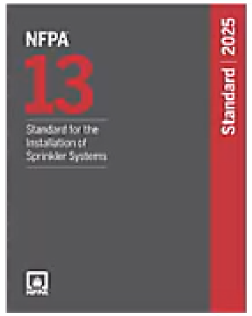
YouTube

NSVSOFT.NET

Small Room Rule and Distance from Wall Allowance



Small Room



Small Room Definition: 3.3.214

Small Room Requirements According to NFPA 13:

1- Compartment

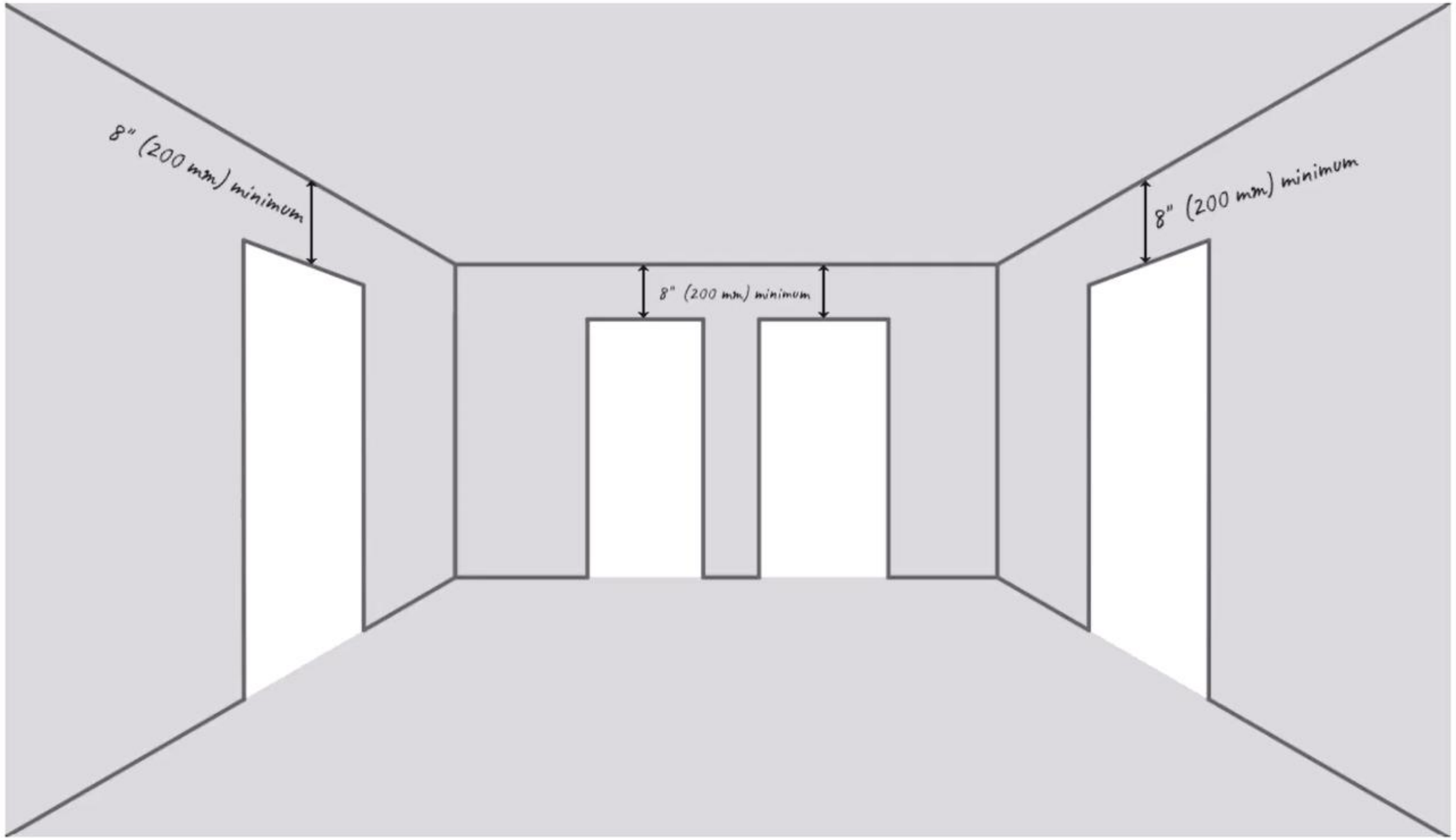
2- Light Hazard

3- Unobstructed Construction

4- Area not exceeding 800 ft^2 (74 m^2)

Compartment

Compartment Definition: 3.3.43



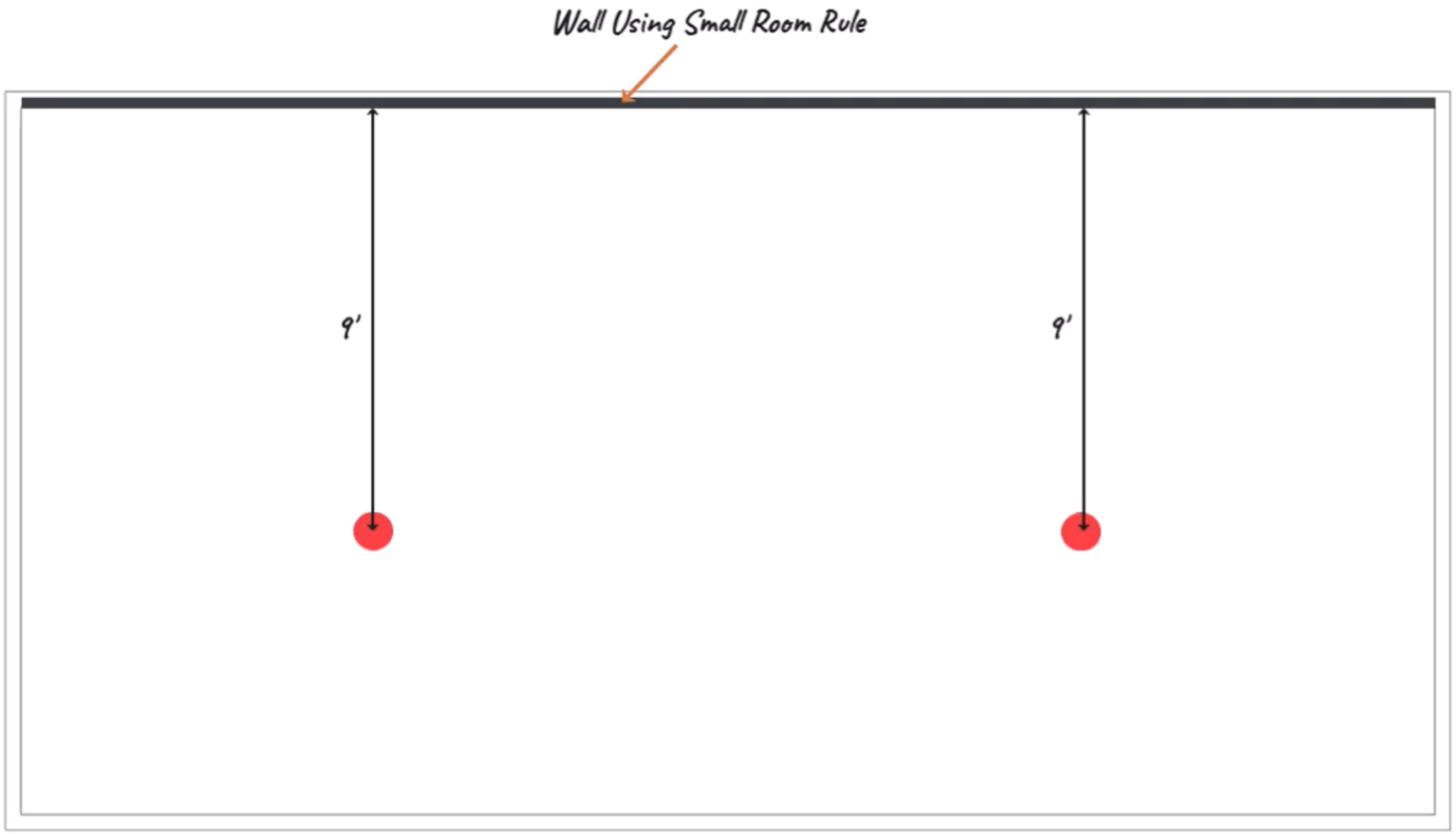
DEFINITIONS

YouTube

NSV
NSVSOFT.NET

Distance to Wall Allowance

Maximum Spacing: Table 10.2.4.2.1(a)
Maximum Distance from Walls: 10.2.6.2.1
Small Room Rule: 10.2.6.2.3.1



SMALL ROOM RULE

YouTube

NSV
NSVSOFT.NET

SMALL ROOM RULE

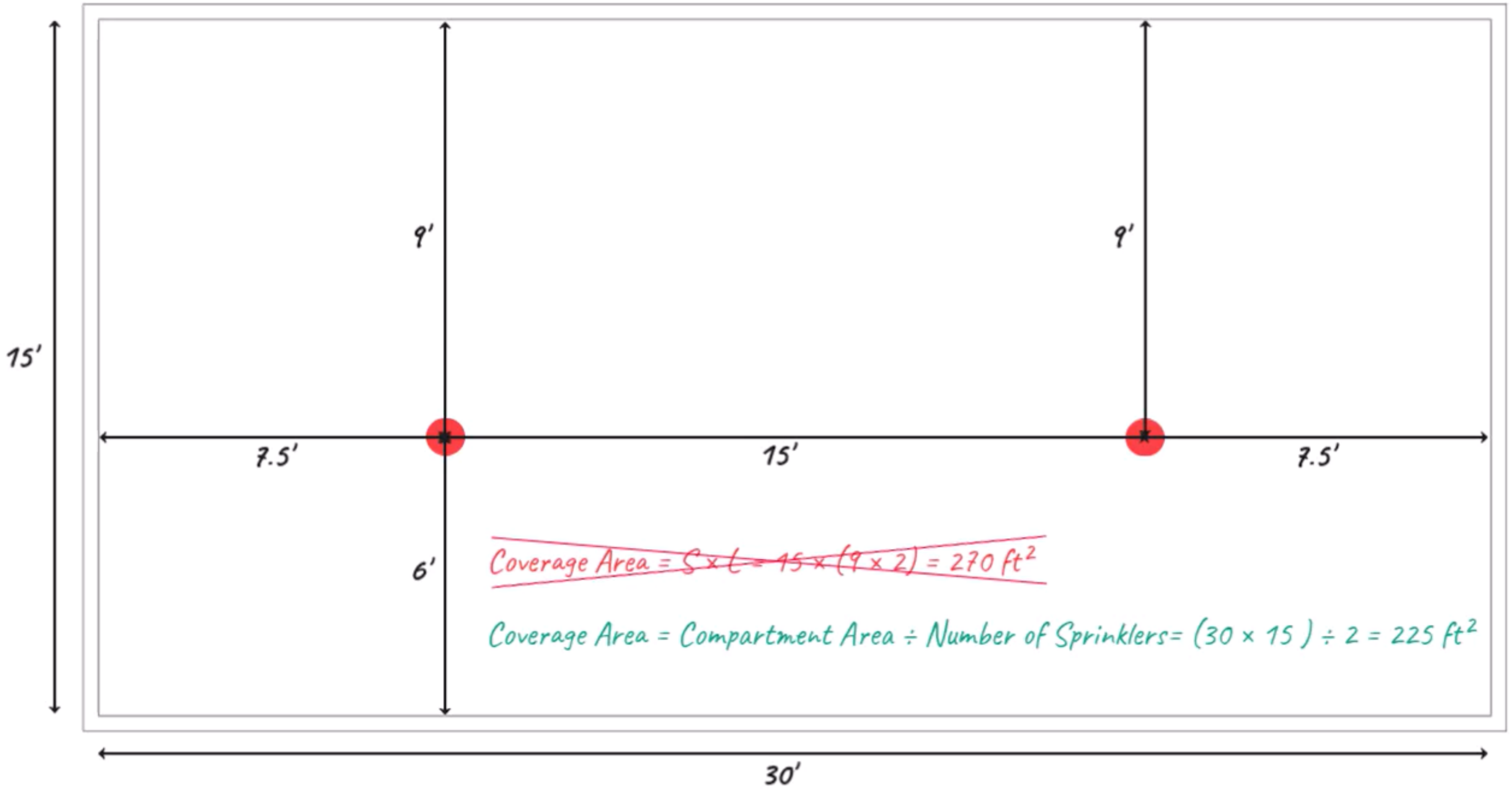
Coverage Area of Sprinklers

Maximum Spacing: Table 10.2.4.2.1(a)

Maximum Distance from Walls: 10.2.6.2.1

Small Room Rule: 10.2.6.2.3.1

Coverage Area of Sprinkler: 10.2.4.1.2.1



YouTube

NSV
NSVSOFT.NET

Beam Rule

Beam Rule

BRIEF OVERVIEW

The Beam Rule in NFPA 13, 13R, and 13D ensures sprinklers near beams maintain proper spray patterns and timely activation. It applies when obstructions are within 18 inches vertically of the sprinkler—and water can only pass beneath the obstruction—requiring set clearances between the sprinkler (B) and the beam's near edge (A). Placement too close disrupts discharge and delays activation.

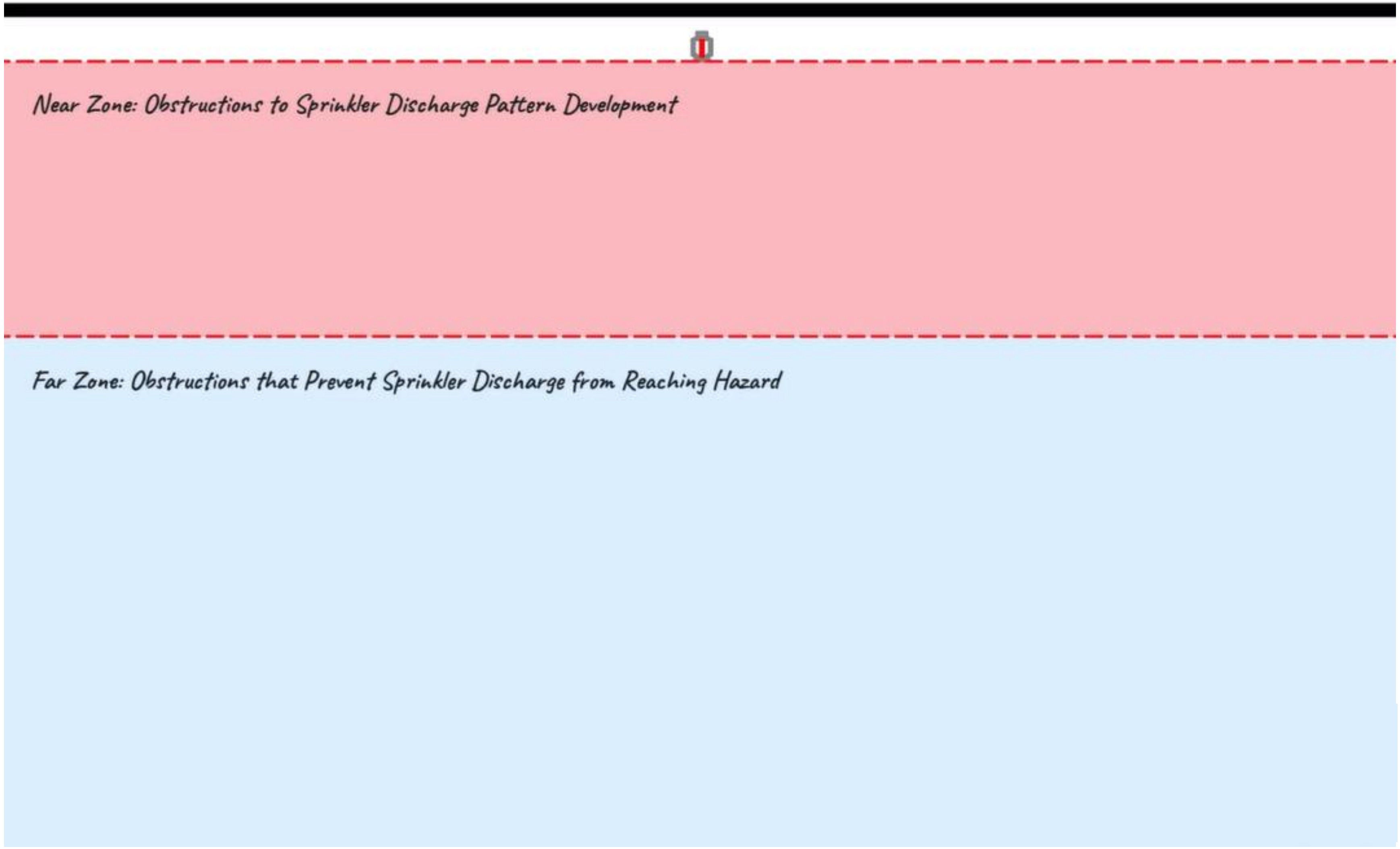
In this video, the Beam Rule, its exceptions, and the coverage area of sprinklers located beneath beams are clearly explained.

NSVCad applies NFPA 13/13R/13D tables, visualizes coverage (blue = full, red = obstructed), checks exceptions, evaluates beam depth and placement, and warns of cold soldering risks, supporting precise and compliant sprinkler design.

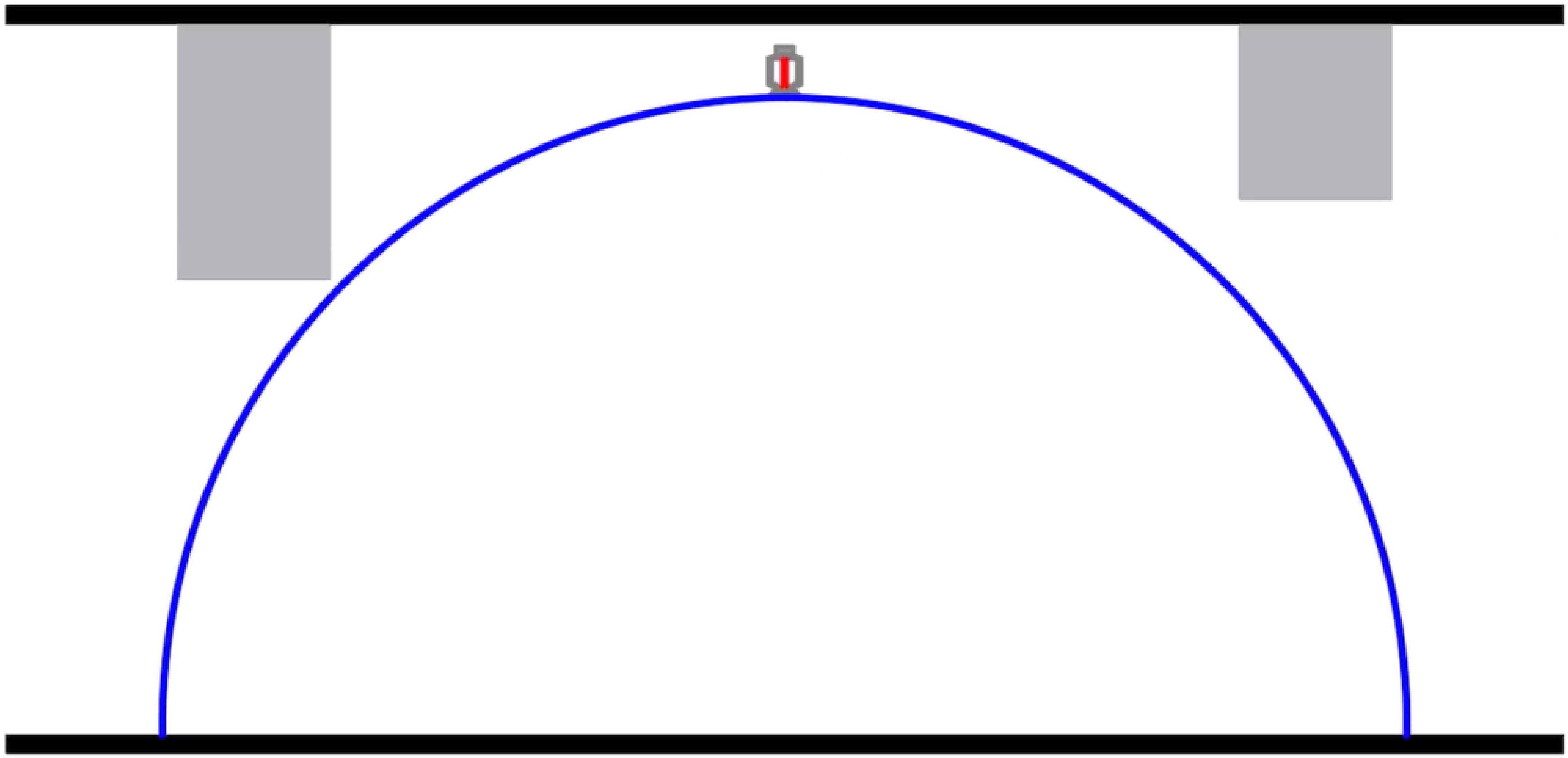
YouTube

NSV
NSVSOFT.NET

Near & Far Zones



Where It’s Required



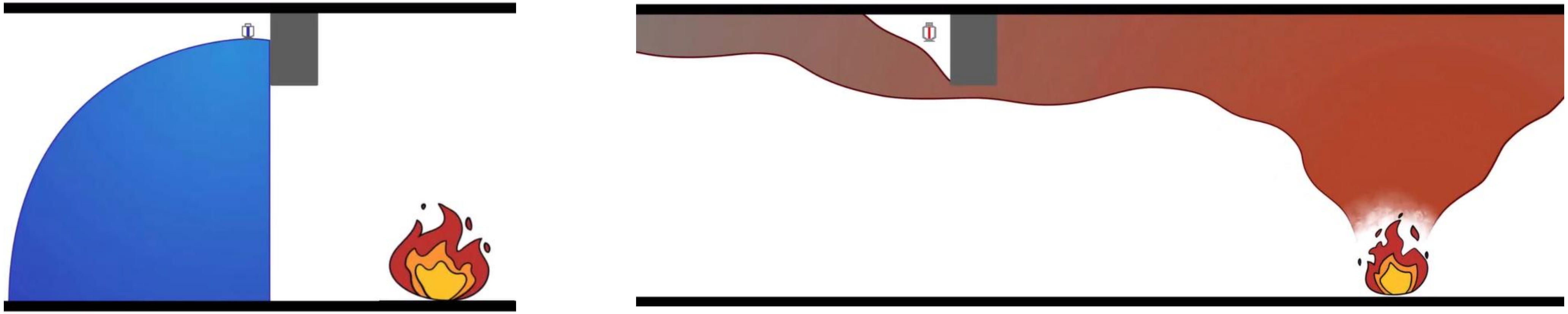
APPLYING THE BEAM RULE

YouTube

NSVSOFT.NET

Are We Allowed to Install Sprinklers Near Obstructions?

IMPORTANT QUESTION

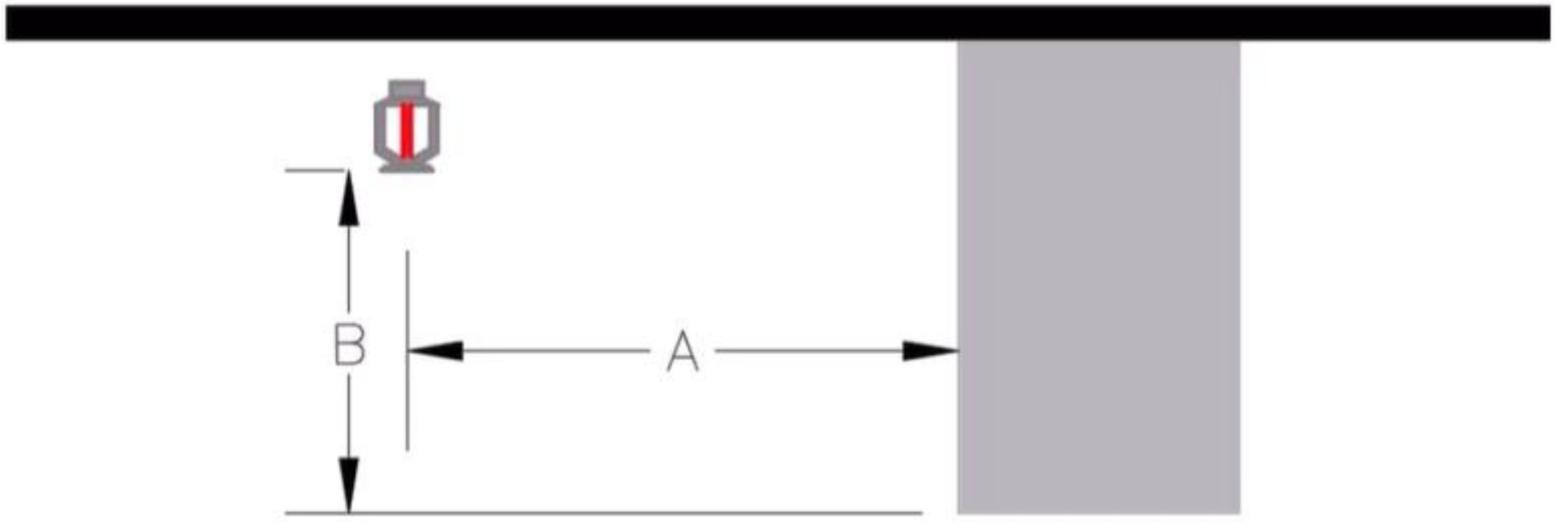


YouTube

NSVSOFT.NET

Defining A & B in Beam Obstruction Analysis

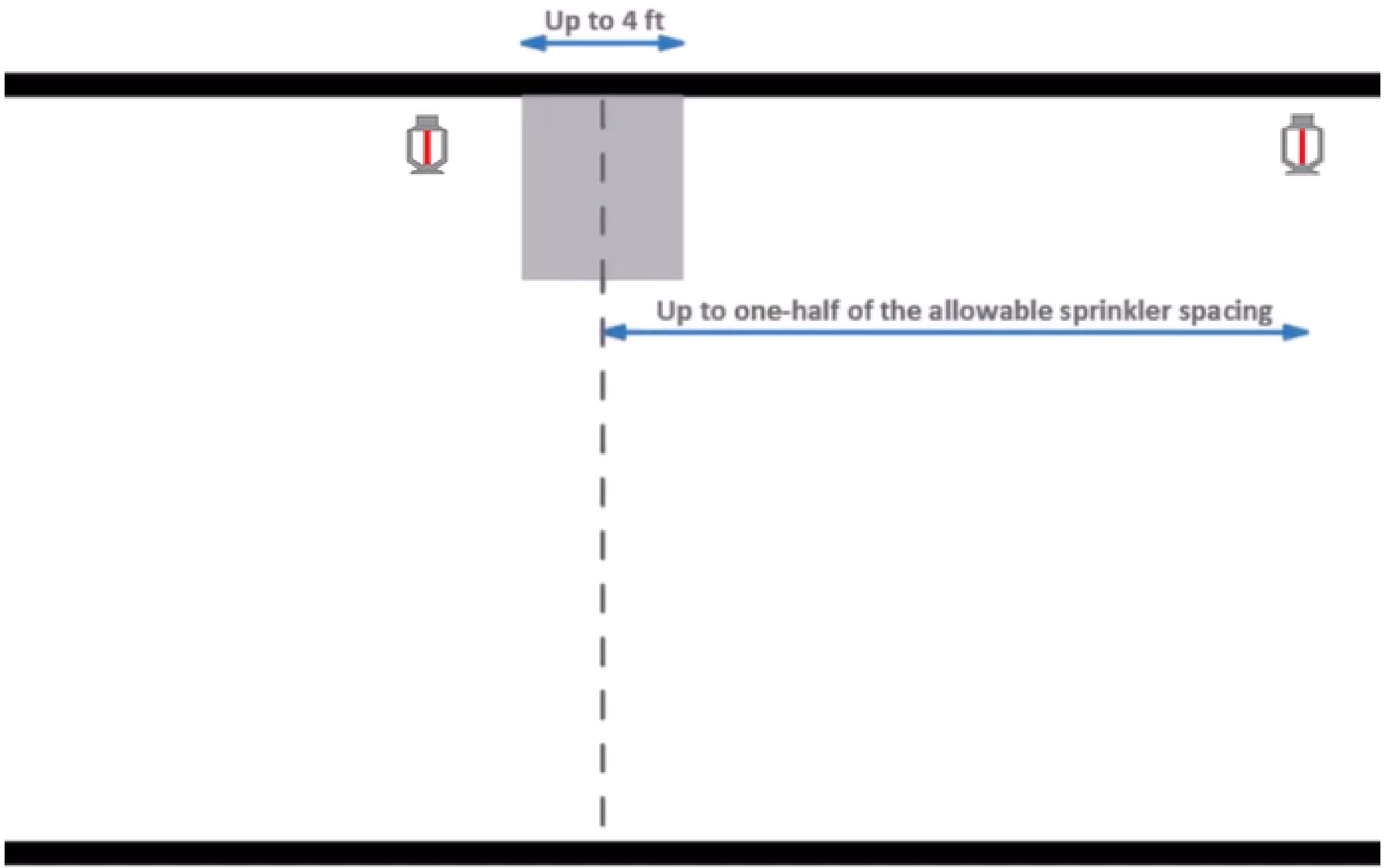
BEAM RULE PARAMETERS



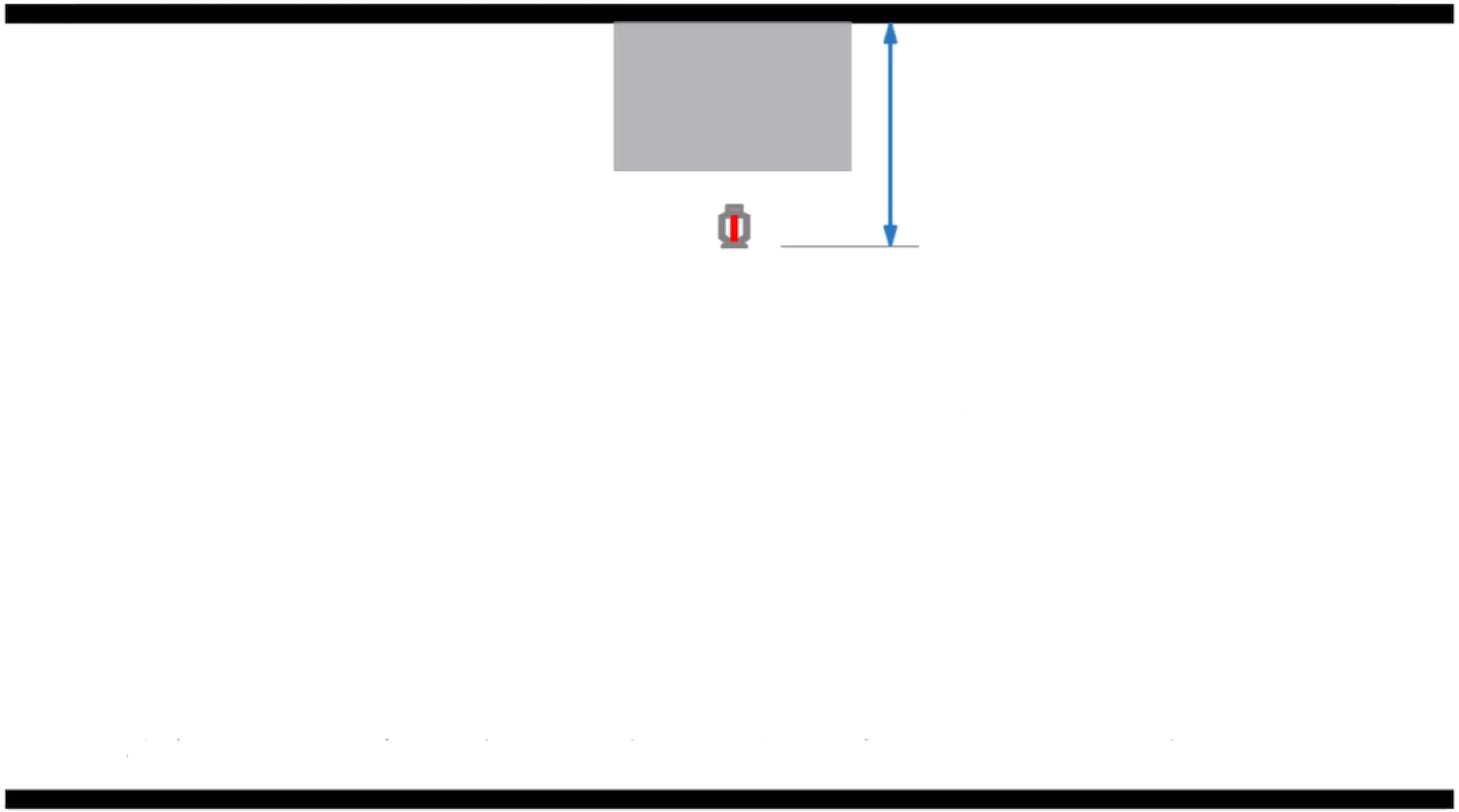
A: Distance from Sprinkler to Side of Obstruction

B: Maximum Allowable Distance of Deflector Above Bottom of Obstruction

The Location of Additional Sprinkler



Coverage Area and Distance From the Ceiling



Soffit Rule

Upright & Pendent Sprinklers

Soffit Rule- Upright & Pendent Sprinklers

BRIEF OVERVIEW

This video explores the soffit rule in NFPA 13, which provides allowances for obstructions located against walls. The soffit rule permits sprinkler coverage without requiring supplemental sprinklers beneath soffits, depending on width and placement.

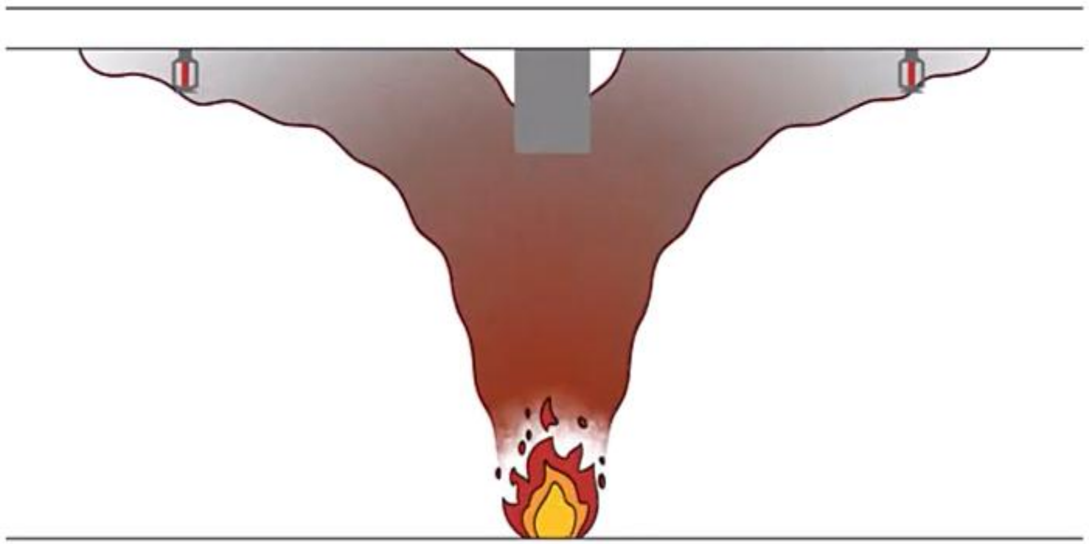
We examine three soffit categories: up to 24 inches, 24–30 inches, and over 30 inches. Historical changes in NFPA 13, 13R, and 13D editions are discussed, highlighting evolving criteria.

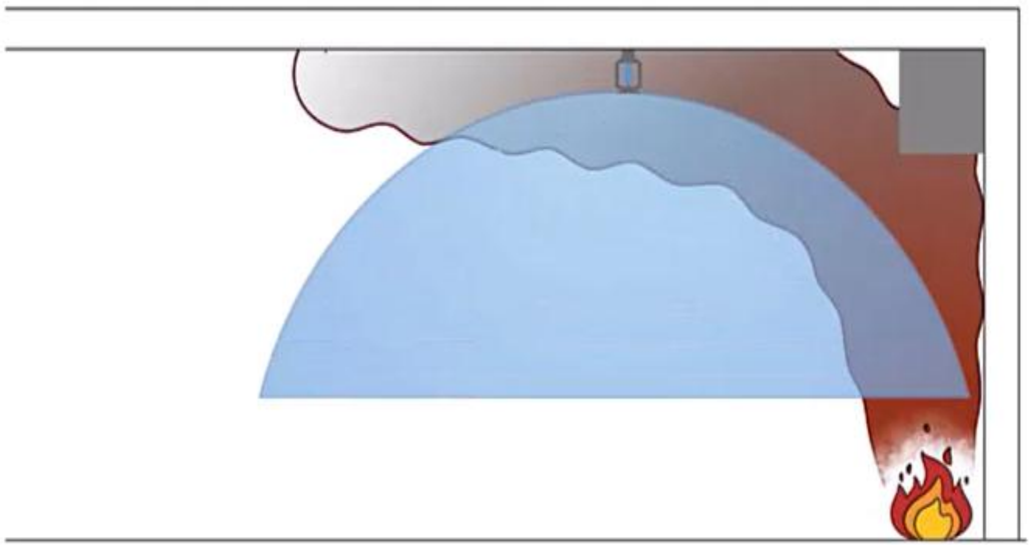
Using NSVCad’s sprinkler layout tool, we demonstrate real-time evaluation of soffit compliance, coverage visualization, and placement restrictions to avoid dead airspace. The software calculates required distances and displays uncovered areas, guiding optimal design. This approach reduces sprinkler count, piping, and labor while ensuring code compliance.

YouTube

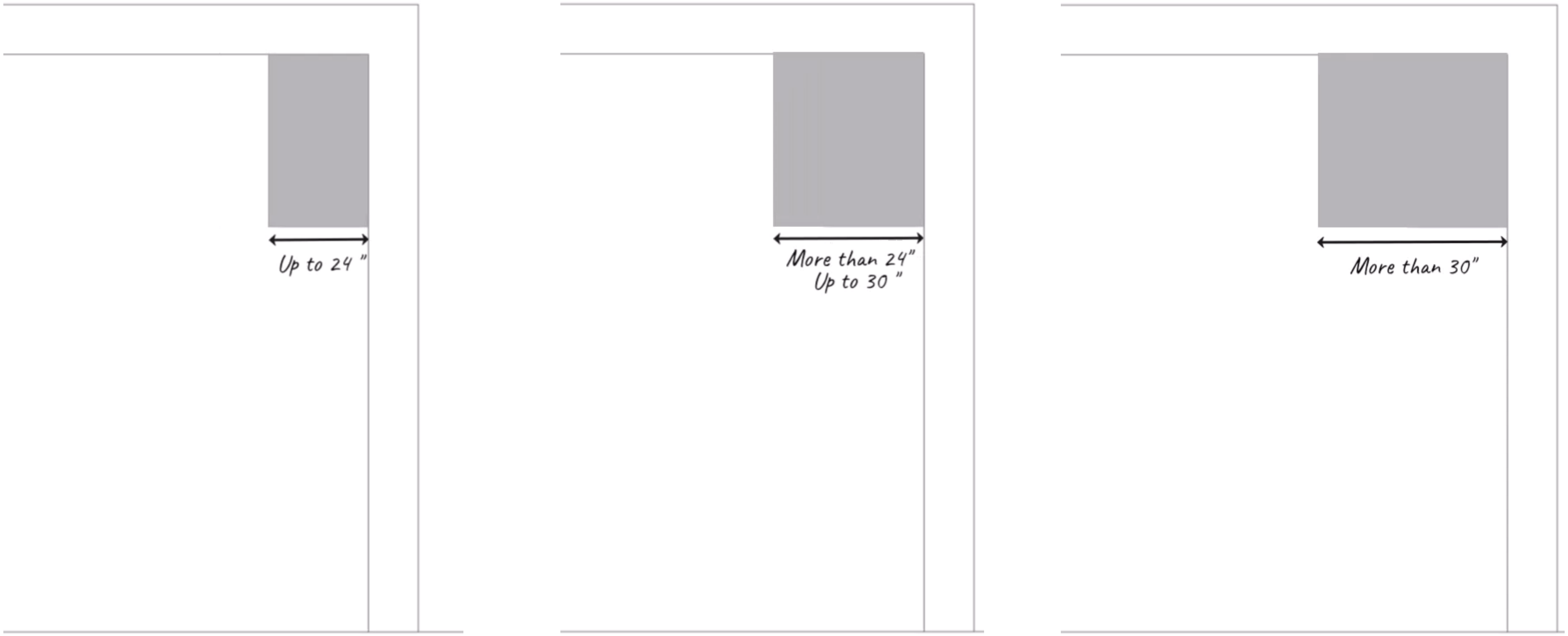
NSVSOFT.NET

The Reason for Greater Flexibility

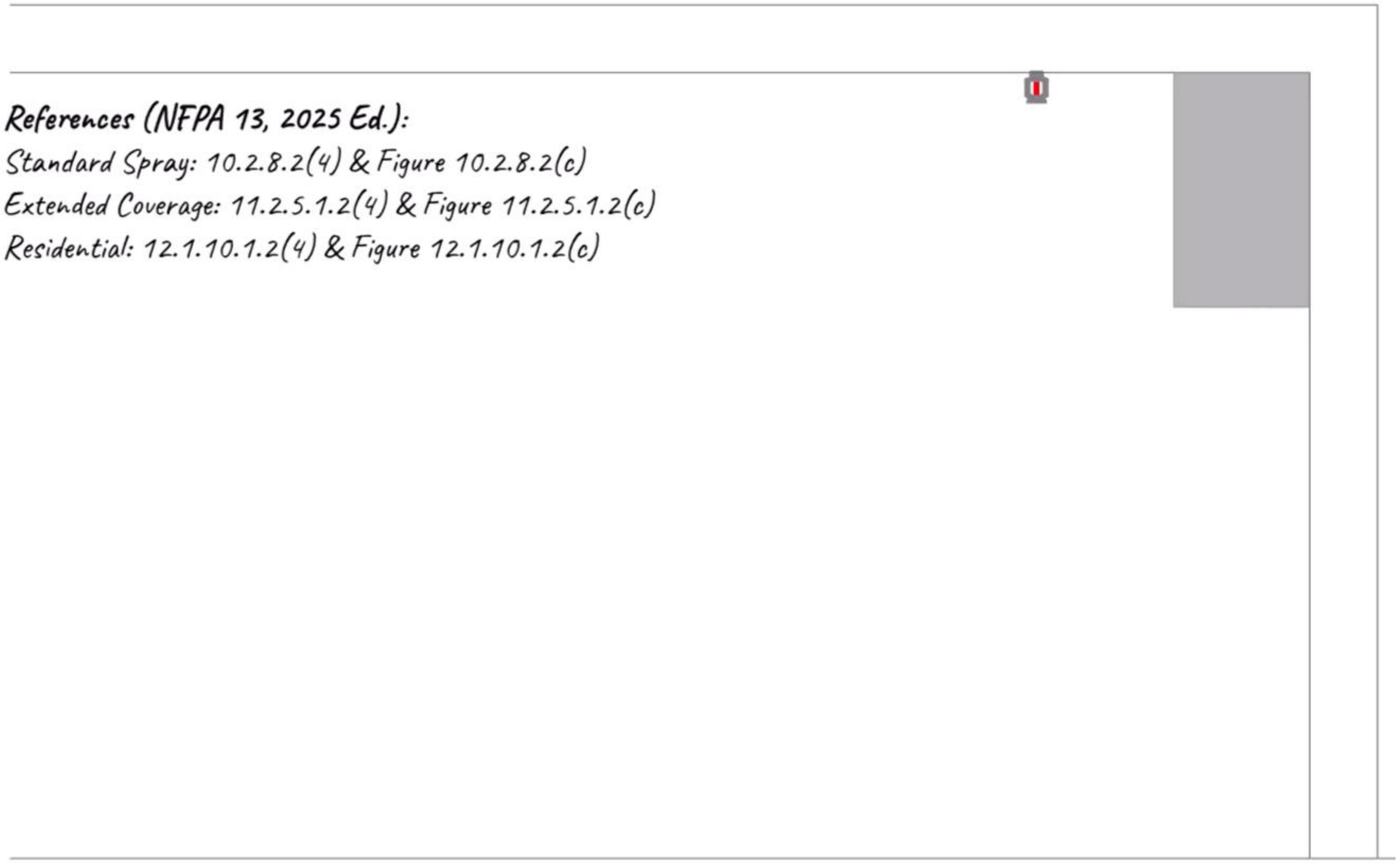




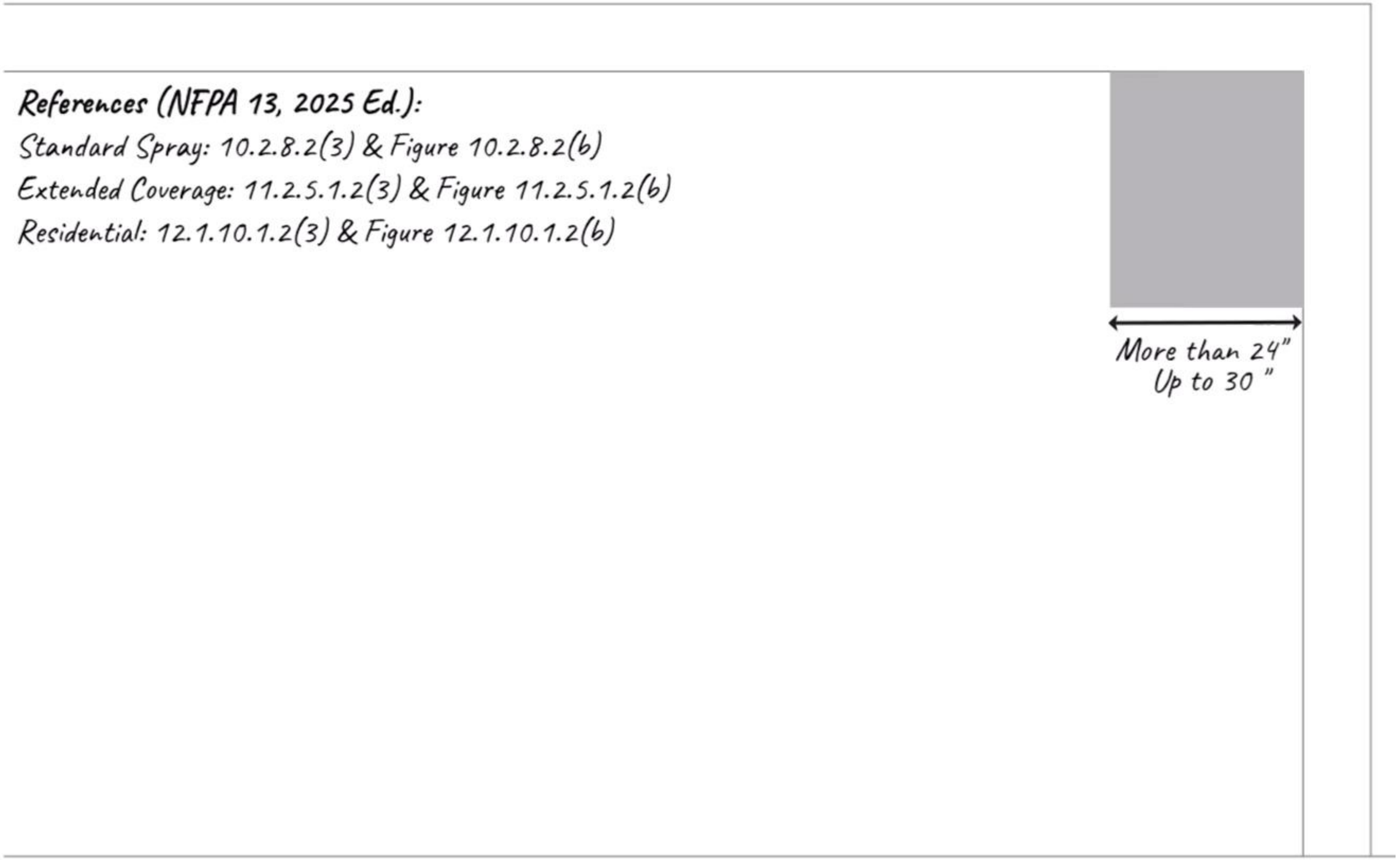
NFPA Requirements and the Soffit Width



Soffits No Wider Than 24 in.



Soffits More Than 24 & Up to 30 in.

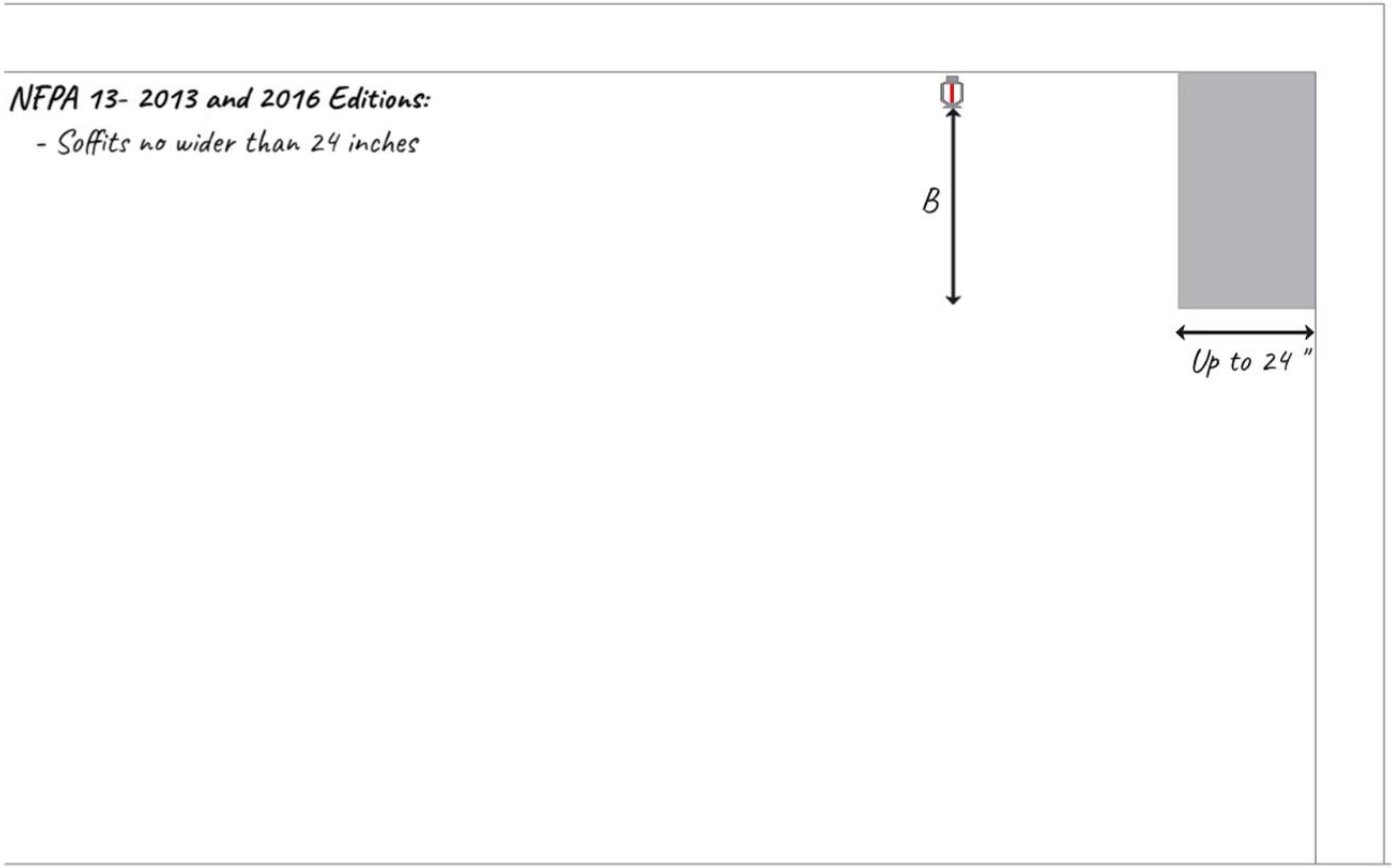


Soffits More Than 30 in.

YouTube

NSVSOFT.NET

Changes in NFPA 13/13R/13D



Soffit Rule

Sidewall Sprinklers

NSVSOFT.NET

BRIEF OVERVIEW

Soffit Rule- Sidewall Sprinklers

This video examines the soffit rule for sidewall sprinklers under NFPA 13, focusing on soffit positions: behind, adjacent, and in front of the sprinkler.

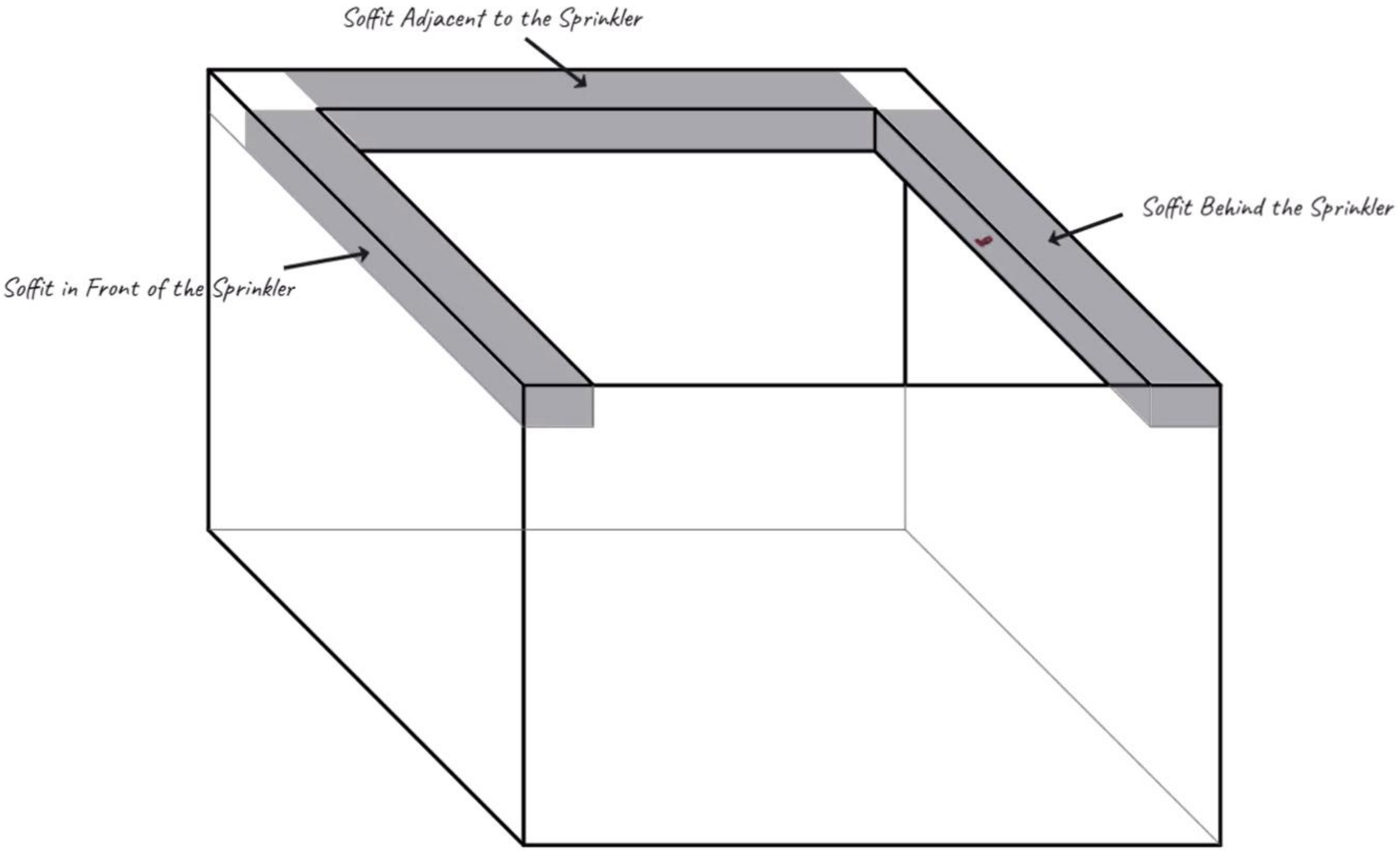
We also review historical changes across NFPA 13, 13R, and 13D editions.

Using NSVCad, we demonstrate real-time soffit evaluation, coverage visualization, and compliance alerts. The software calculates required distances, highlights unprotected areas, and restricts placement near soffits. This tool streamlines layout design, reduces errors, and ensures NFPA compliance

YouTube

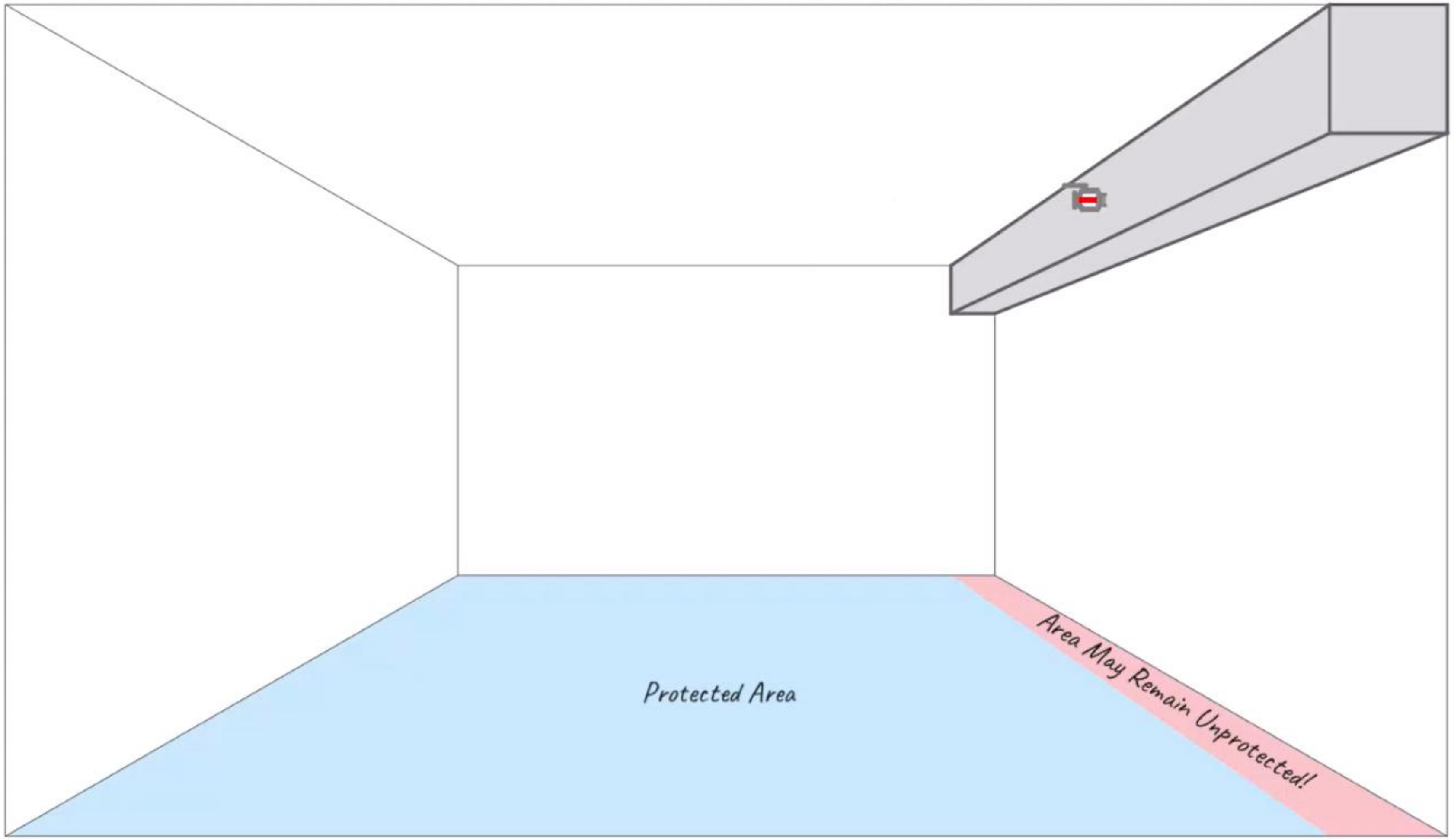
NSVSOFT.NET

Soffit Location and Installation Requirements



SOFFIT BEHIND THE SPRINKLER

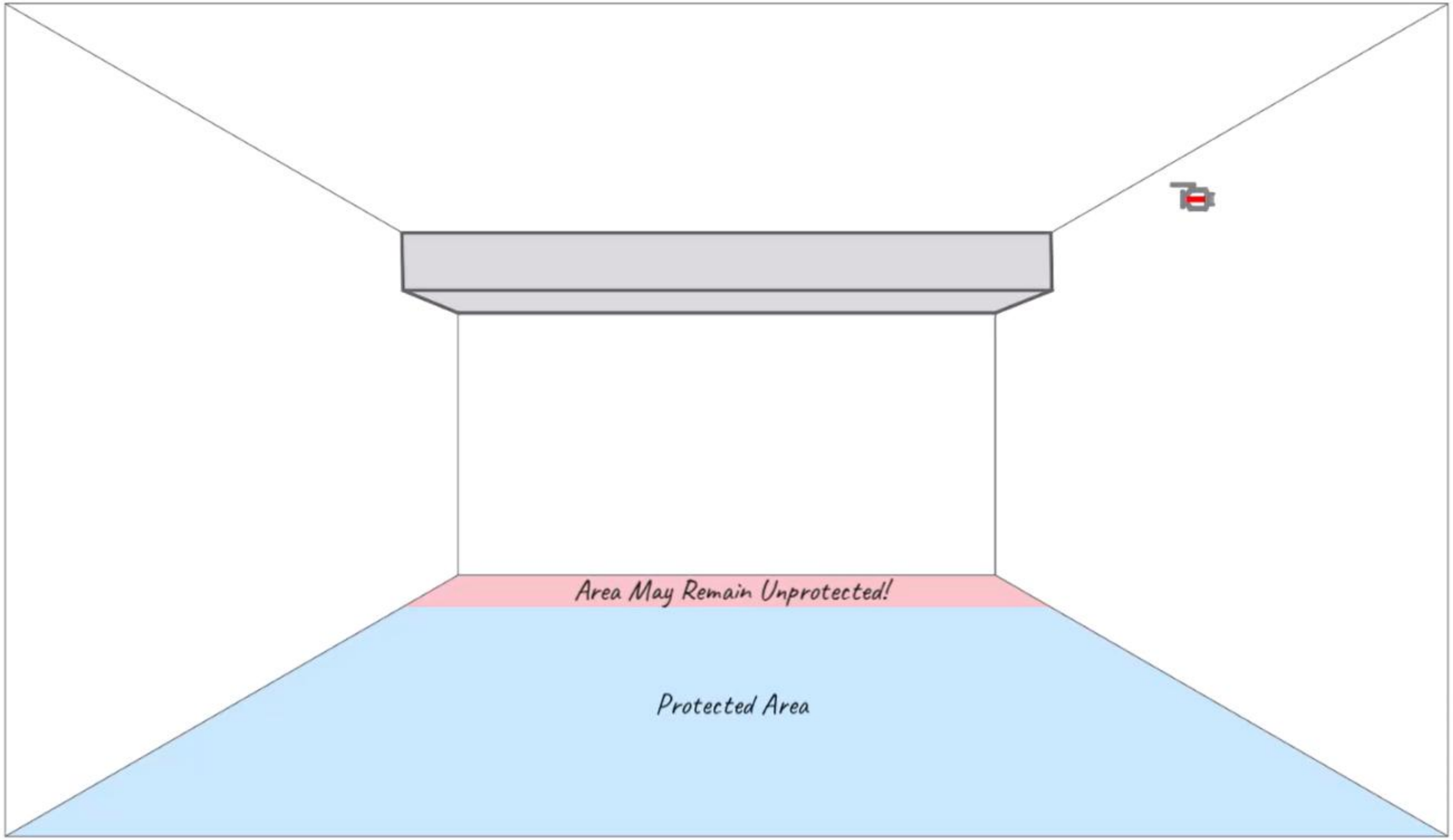
Installation Requirements



YouTube

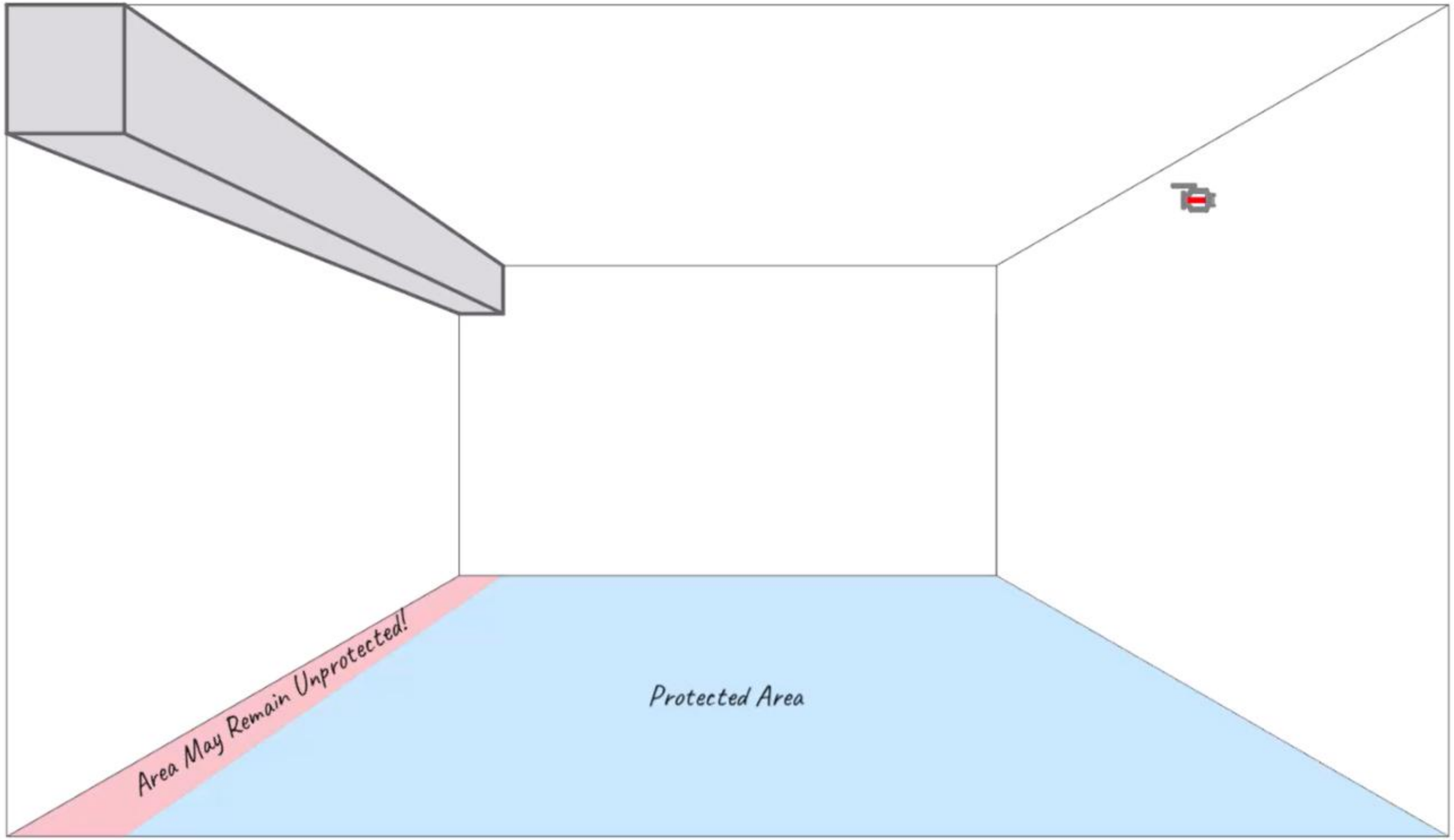
NSV
NSVSOFT.NET

Installation Requirements



SOFFIT IN FRONT OF SPRINKLER

Installation Requirements



YouTube

NSVSOFT.NET

Changes in NFPA 13/13R/13D

Edition	$A \geq (D-8) + B$	Up to 24 in
2025	Applicable	Applicable
2022	Applicable	Applicable
2019	Applicable	Applicable
2016	Applicable	Applicable
2013	Not Applicable	Not Applicable

Residential & Extended Coverage Sprinklers

The Three & Four Times Rules

NSVSOFT.NET

BRIEF OVERVIEW

The Three and Four Times Rules

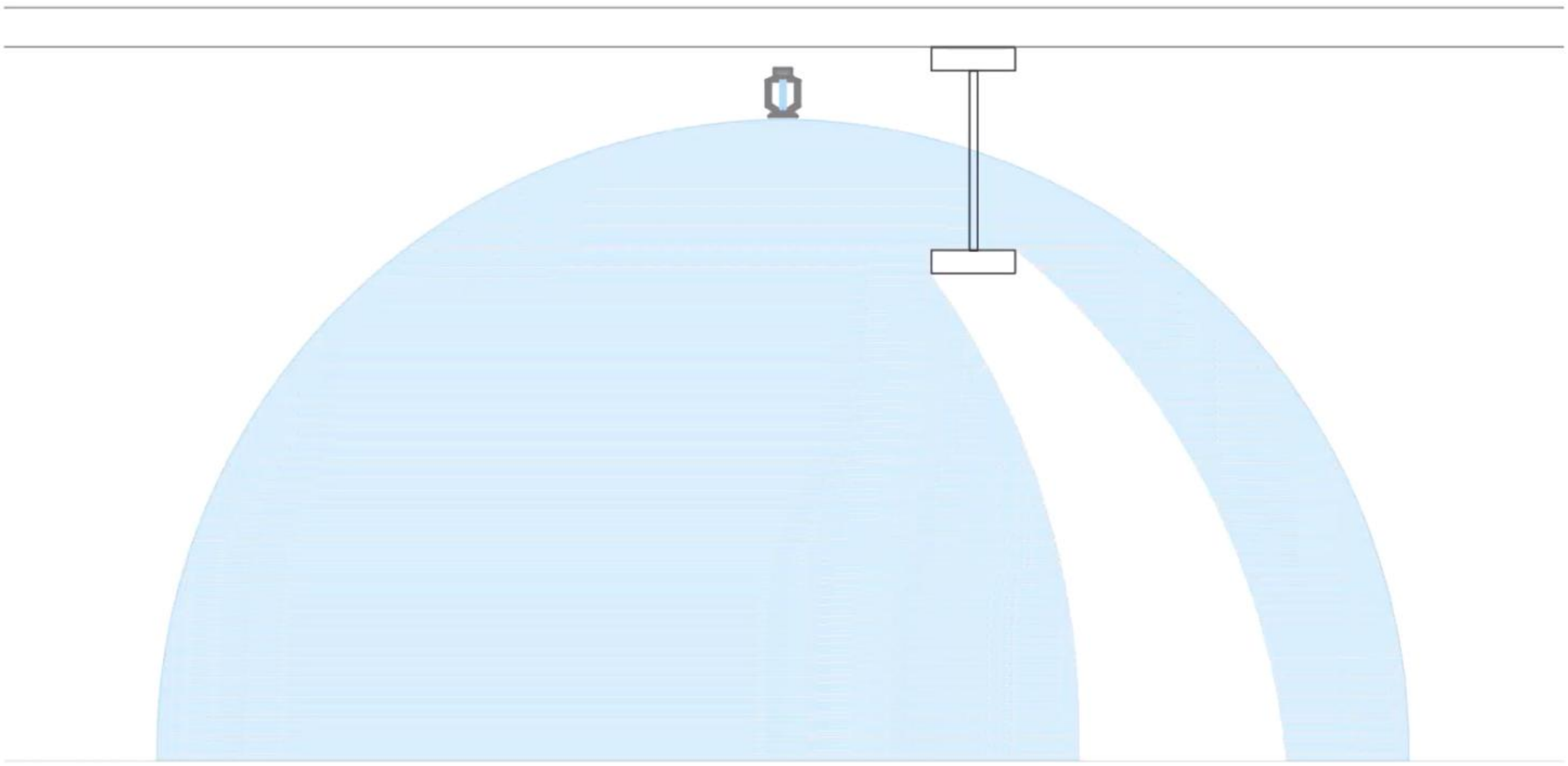
This video explores NFPA 13 obstruction rules for scenarios where water can pass on both sides of an object within 18 inches of the sprinkler deflector. We explain the “three times rule” for standard spray sprinklers and the “four times rule” for extended coverage and residential types. Using examples like cable trays and open web joists, we demonstrate how to calculate minimum clearance and apply exceptions such as the 24-inch maximum clear distance. The Isman Method is introduced to evaluate shadow areas and determine optimal sprinkler placement. We also review allowances for non-structural elements and piping under 3 inches in diameter.

To interpret whether an element conceals, obscures, or obstructs sprinkler discharge, the AHJ may evaluate both the physical characteristics of the obstruction and the expected spray pattern. This qualitative judgment is explained in the video.

Using NSVCad software, we simulate layout in a parking area with columns and cable trays, applying obstruction rules and visualizing coverage zones. The software calculates distances, highlights shadow areas, and ensures compliance with NFPA 13. This approach supports efficient, code-compliant sprinkler design in complex environments.

INTRODUCTION

Where Are These Rules Applicable?



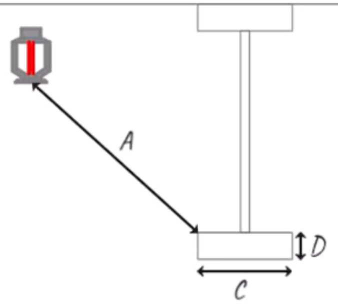
YouTube

NSVSOFT.NET

Standard Spray Sprinklers

THREE TIMES RULE

10.2.8.3.1.4

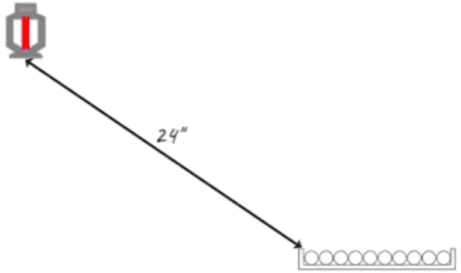


If $C > D$, then $A \geq 3C$
If $D > C$, then $A \geq 3D$

Maximum Clear Distance

1st EXCEPTION

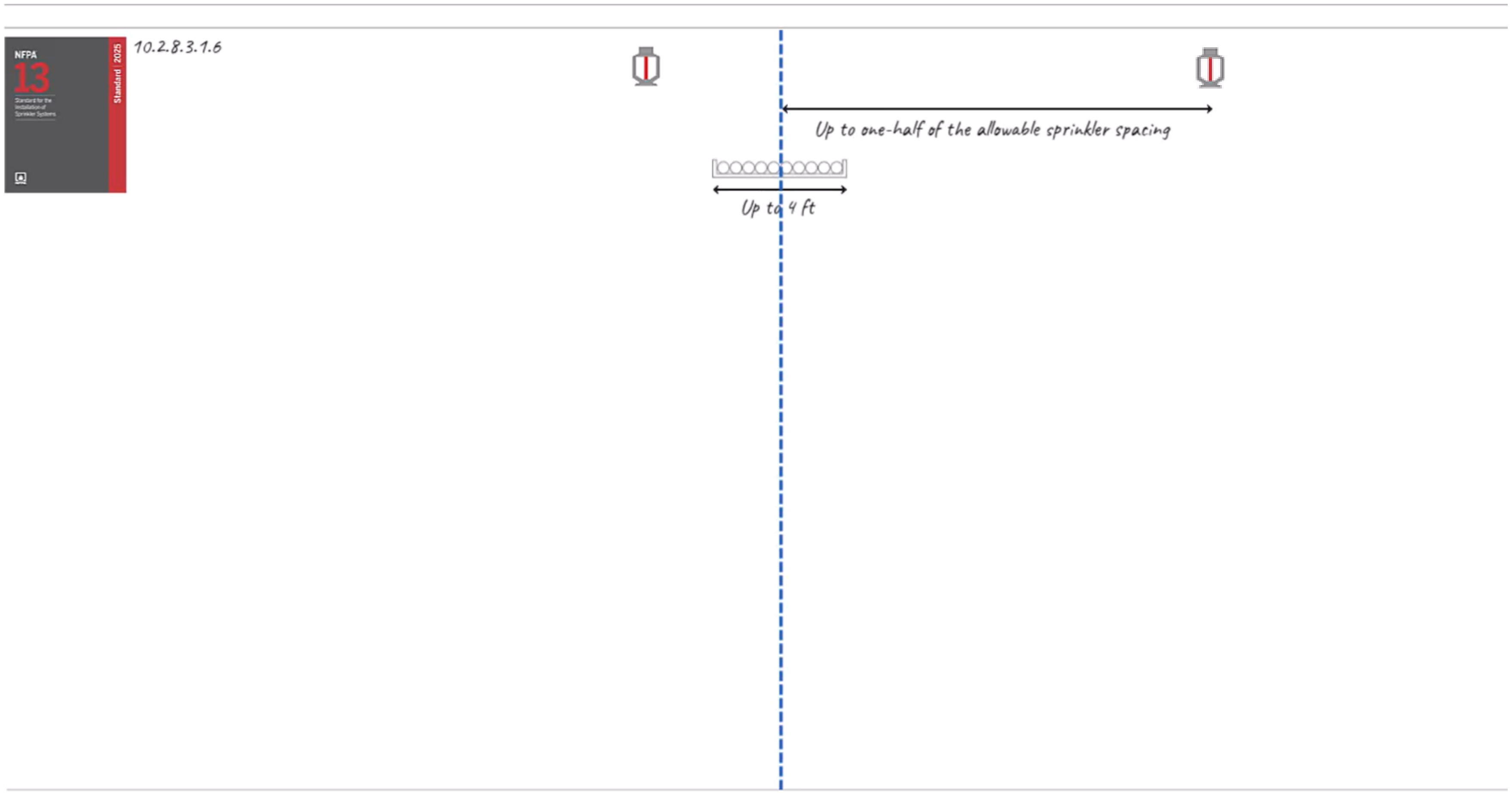
10.2.8.3.1.4 (A)



YouTube

NSVSOFT.NET

Sprinklers On Opposite Side

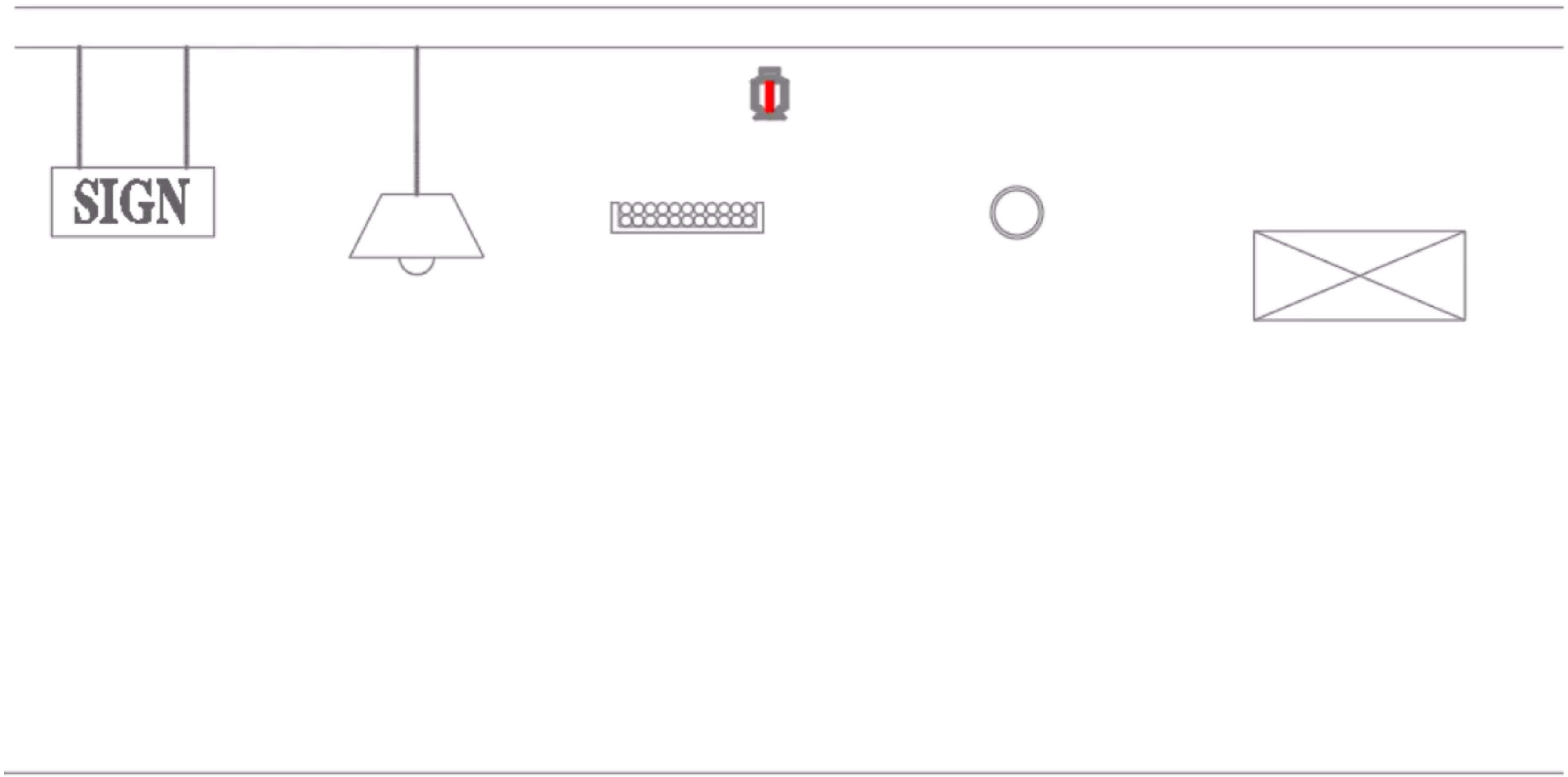


2nd EXCEPTION

YouTube

NSVSOFT.NET

Non-Structural Elements in LH and OH Occupancies



3rd EXCEPTION

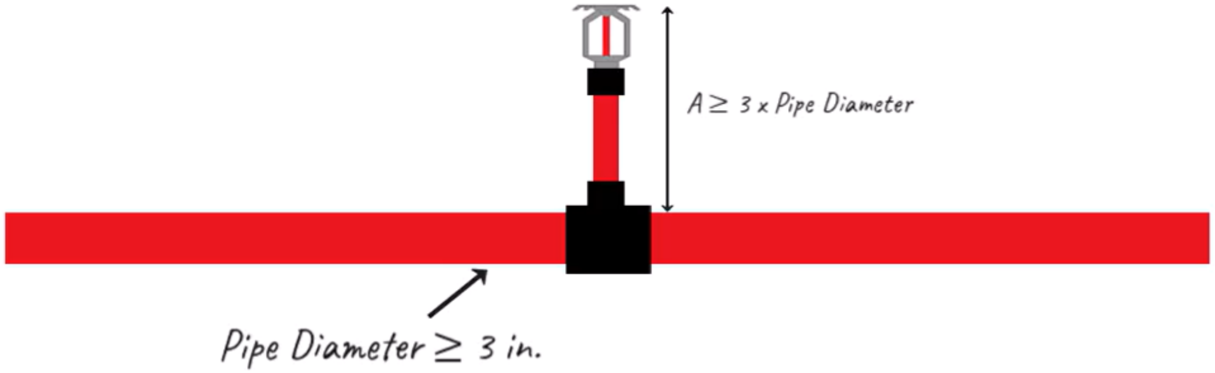
YouTube

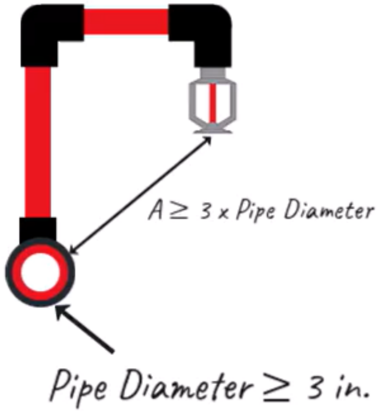
NSVSOFT.NET

Sprinkler Piping Less Than 3 in.

4th EXCEPTION

10.2.8.3.1.9





Shadow Area

BRIEF OVERVIEW

Shadow Area

This video introduces the concept of shadow areas—dry zones caused by obstructions that block sprinkler discharge—and explains how NSVCad helps ensure NFPA compliance. Defined in NFPA 13D and 13R (2013), shadow areas must not exceed 15 ft^2 per residential sprinkler (NFPA 13, 2019).

To determine the allowable shadow area for standard spray and extended coverage sprinklers, Professor Kenneth Isman's equivalency method applies the "three-times" and "four-times" rules, respectively. These calculations help estimate permissible dry zones based on obstruction geometry and sprinkler type, but final acceptance remains subject to the AHJ.

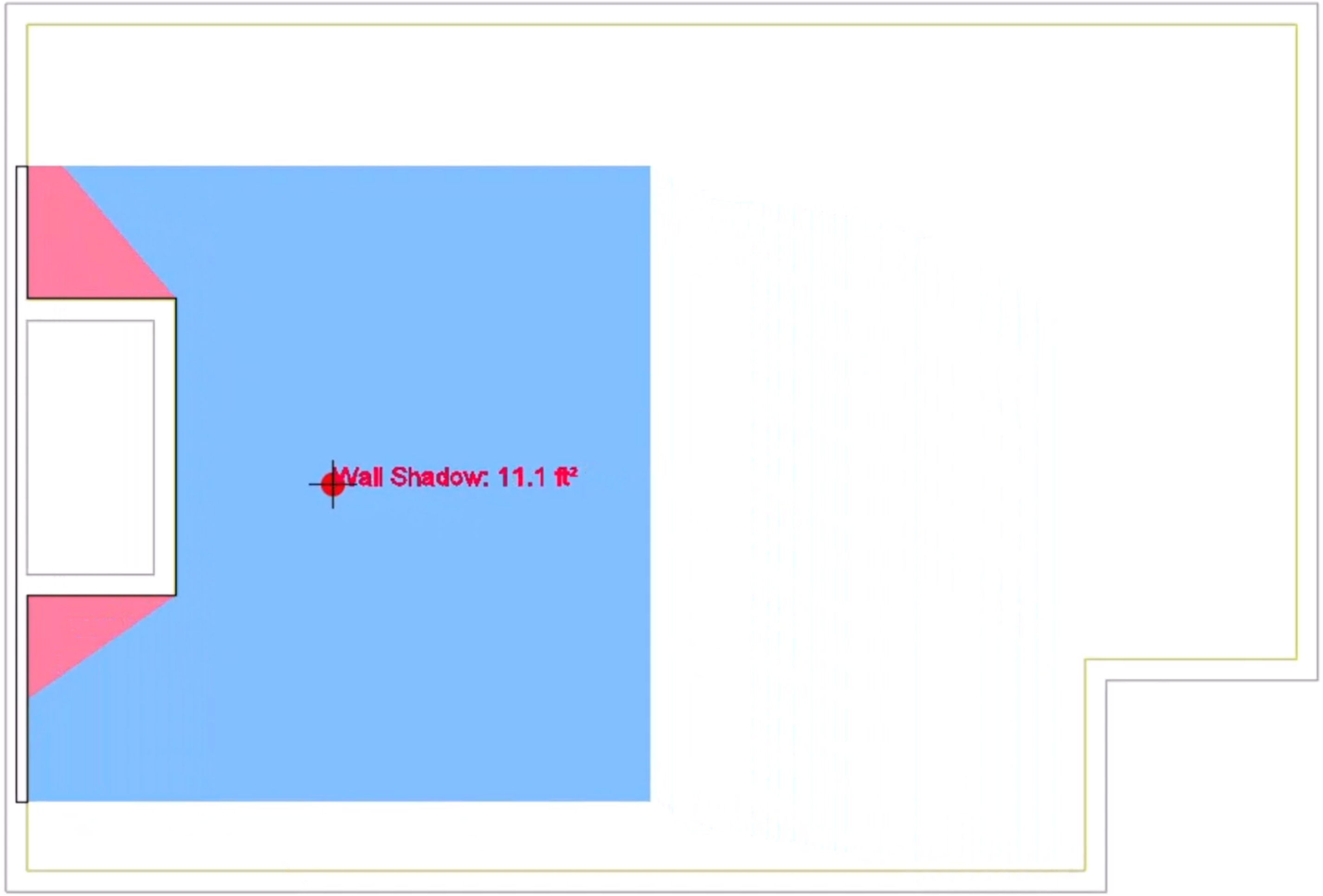
NSVCad dynamically calculates shadow areas, color-coding compliant zones in blue and violations in red, with real-time values to guide placement. The result: efficient, NFPA-compliant designs using fewer sprinklers without compromising safety.

YouTube

NSVSOFT.NET

WHAT IS THE SHADOW AREA?

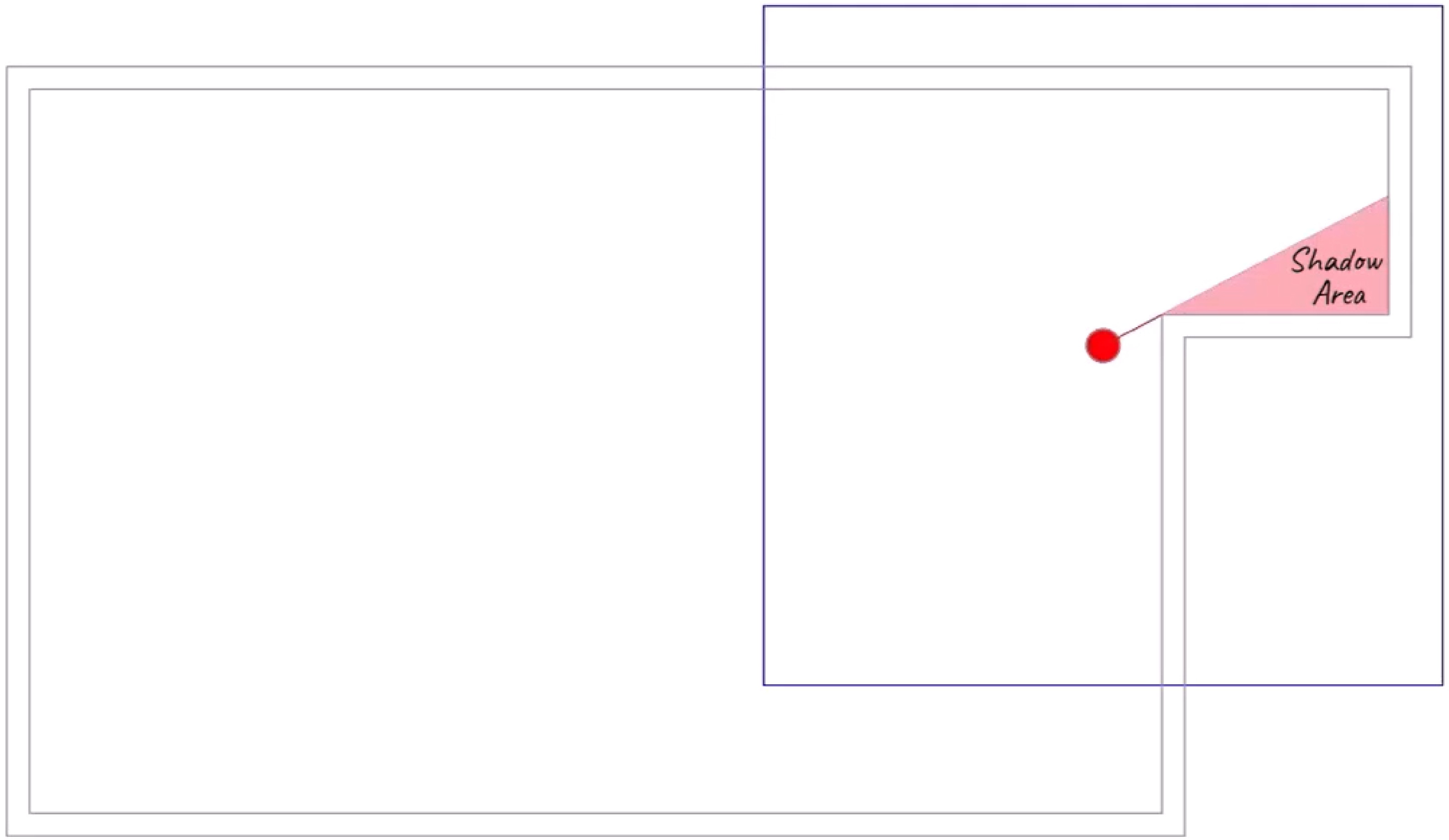
Definition of the Shadow Area



YouTube

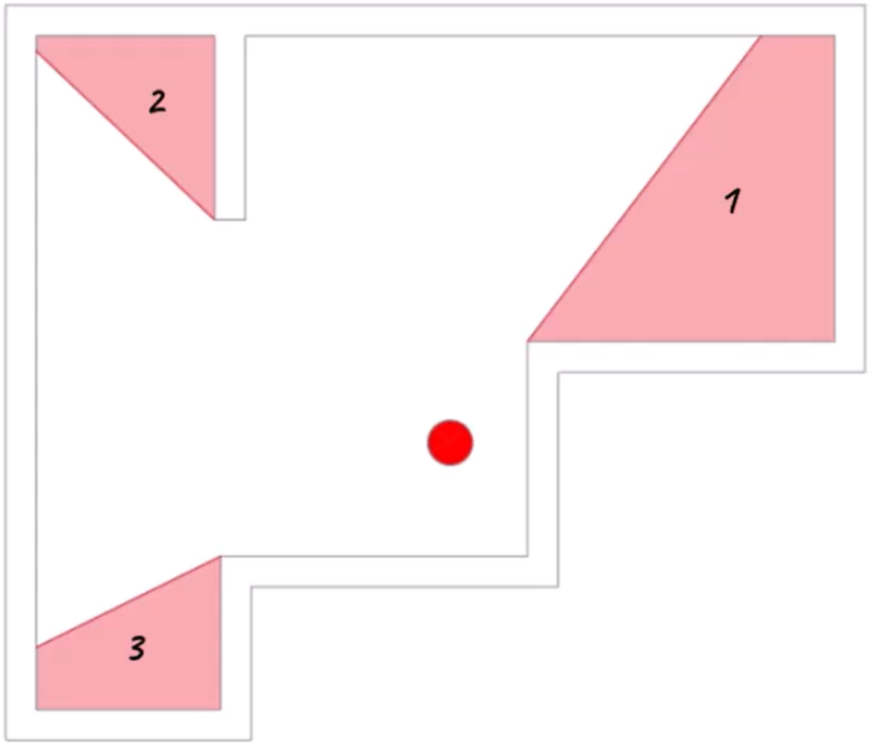
NSV
NSVSOFT.NET

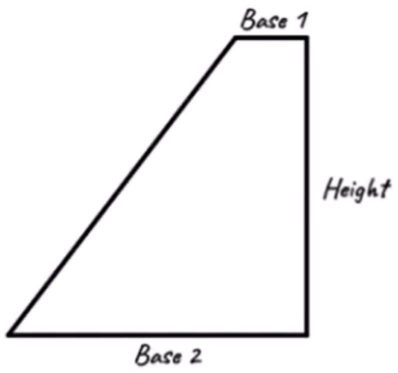
Drawing the Shadow Area



Residential Sprinklers

MAXIMUM PERMITTED SHADOW AREA



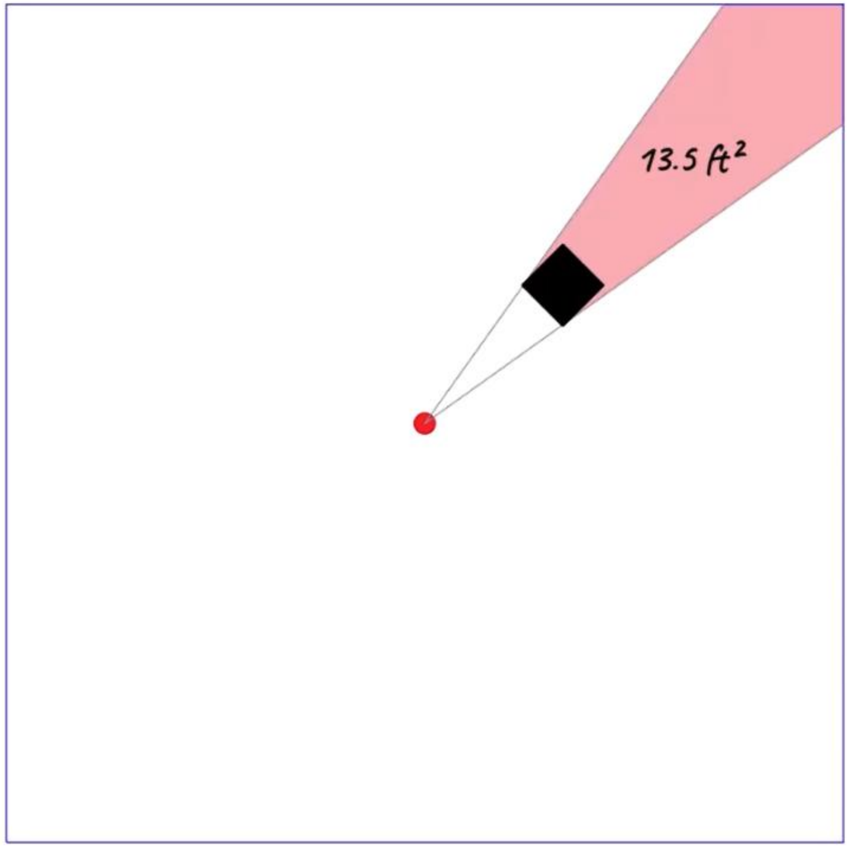


$$\text{Area of Trapezoid} = \frac{(\text{Base 1} + \text{Base 2}) \times \text{Height}}{2}$$

Cumulative Shadow Area = Area of Trapezoid 1 + Area of Trapezoid 2 + Area of Trapezoid 3

MAXIMUM PERMITTED SHADOW AREA

Standard Spray and Extended Coverage Sprinklers



YouTube

NSV
NSVSOFT.NET

Ceiling Pocket

NSVSOFT.NET

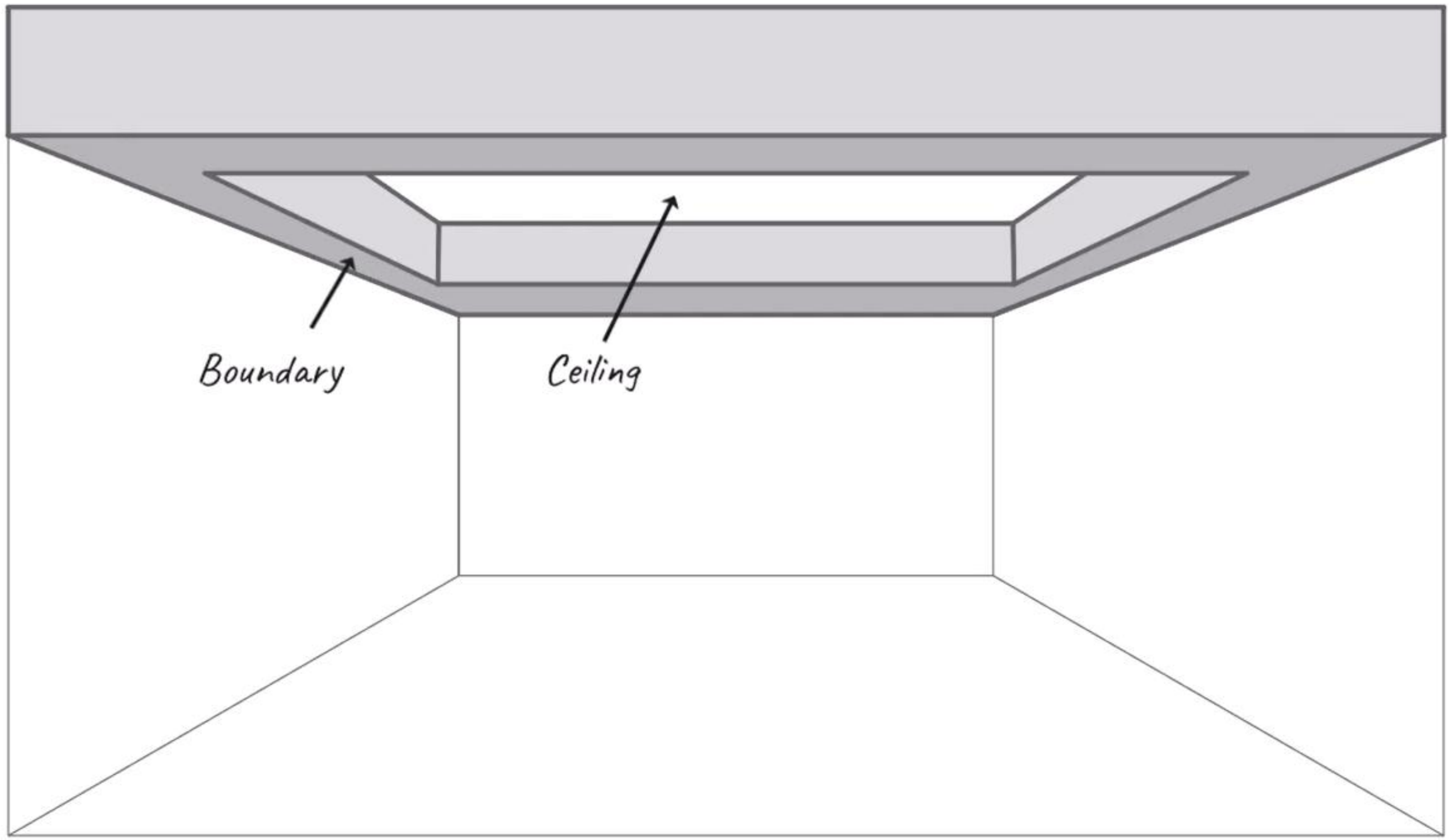
BRIEF OVERVIEW

Ceiling Pocket

This video explains how NFPA 13, 13R, and 13D address ceiling pockets—recessed ceiling areas that may qualify for sprinkler omission under specific conditions. For standard spray and extended coverage sprinklers, omission is permitted if the pocket has non-combustible or limited-combustible finishes, is no deeper than 36 inches, and has a volume up to 1,000 cubic feet. Residential sprinkler rules vary by standard, with stricter limits in NFPA 13 and 13R, and more flexibility in 13D.

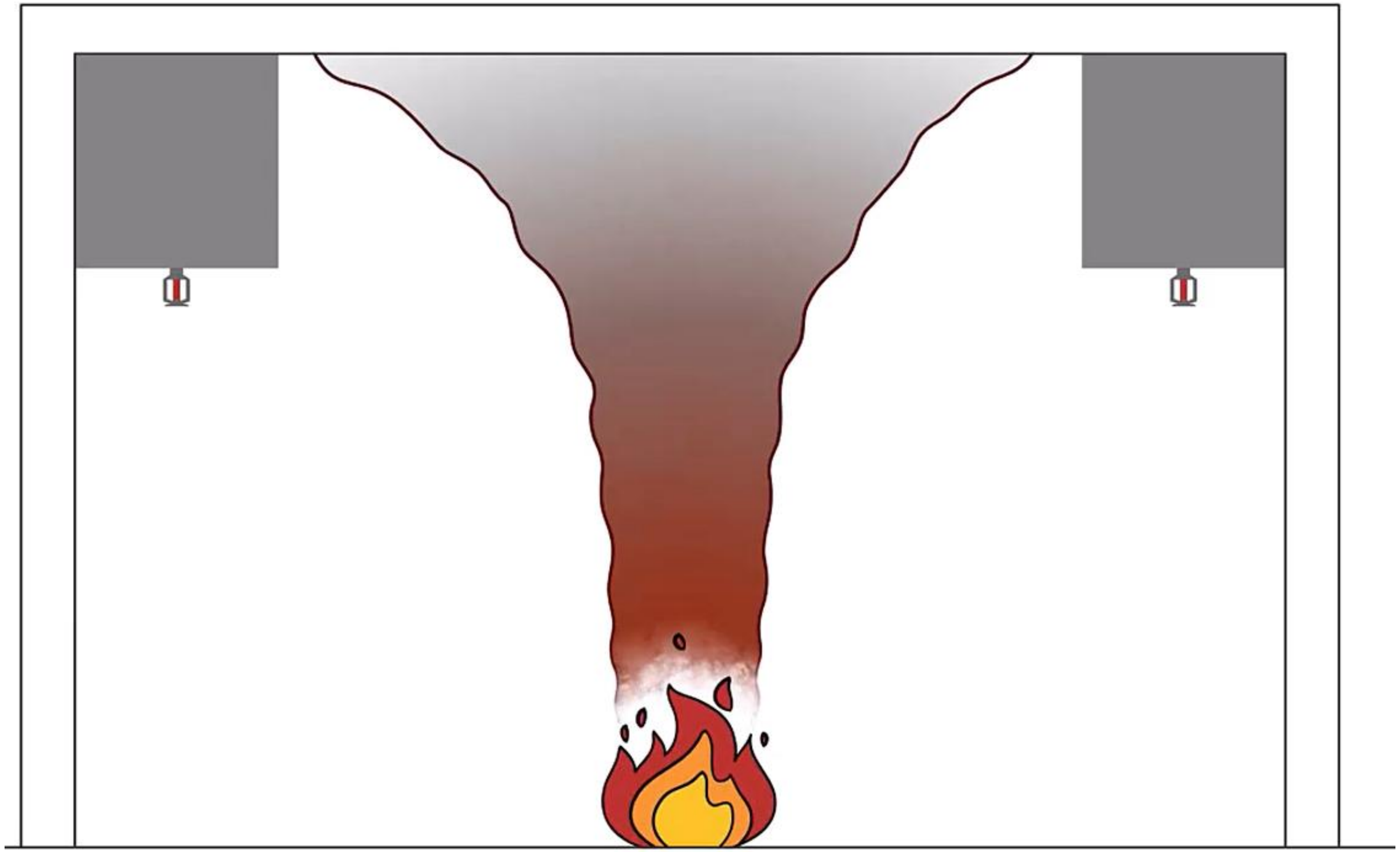
The video demonstrates how NSVCad software calculates pocket dimensions, confirms compliance, and assists in optimal sprinkler placement.

Definition



Effects of Pocket Dimension on Fire Control

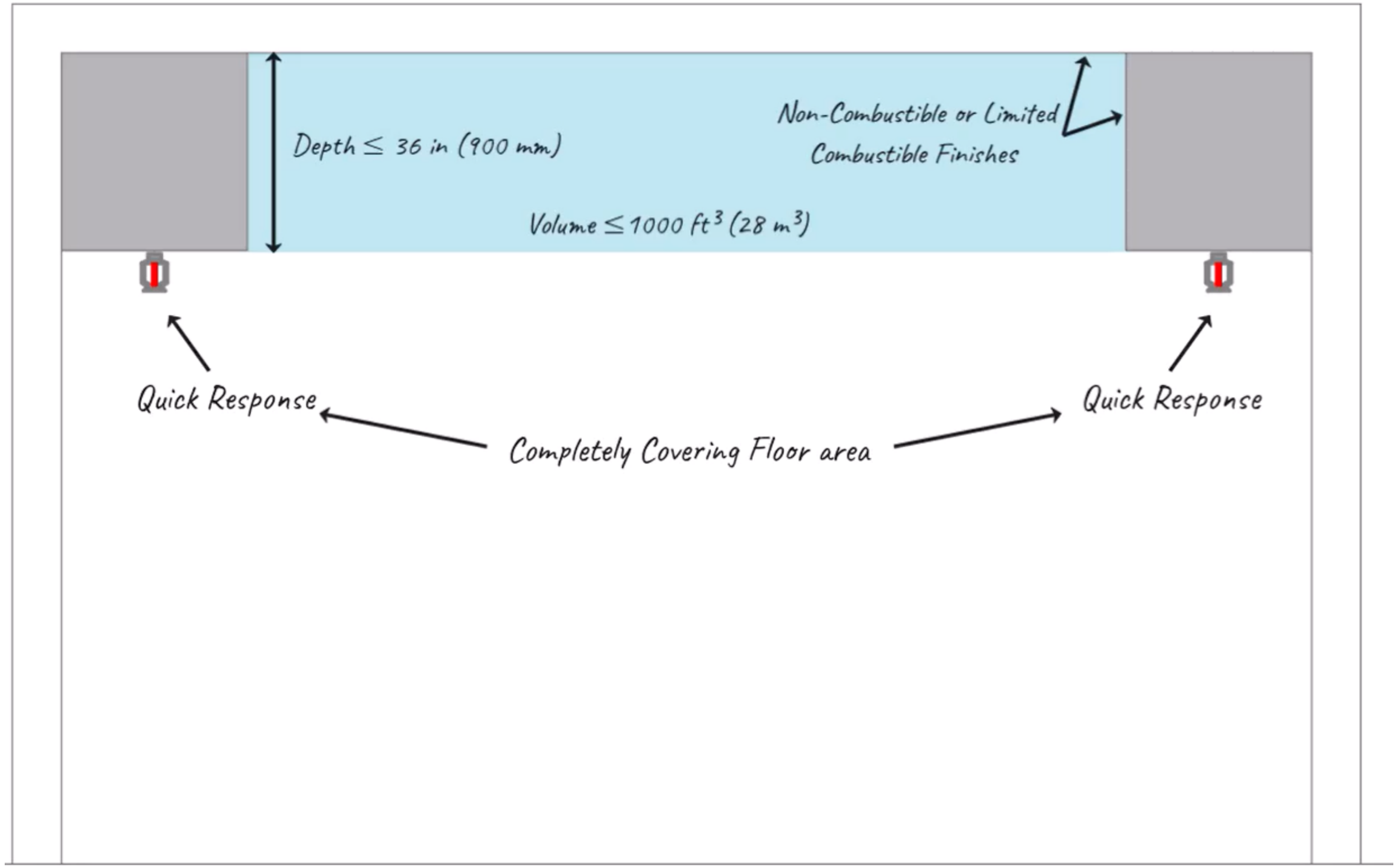
POCKET DIMENSION



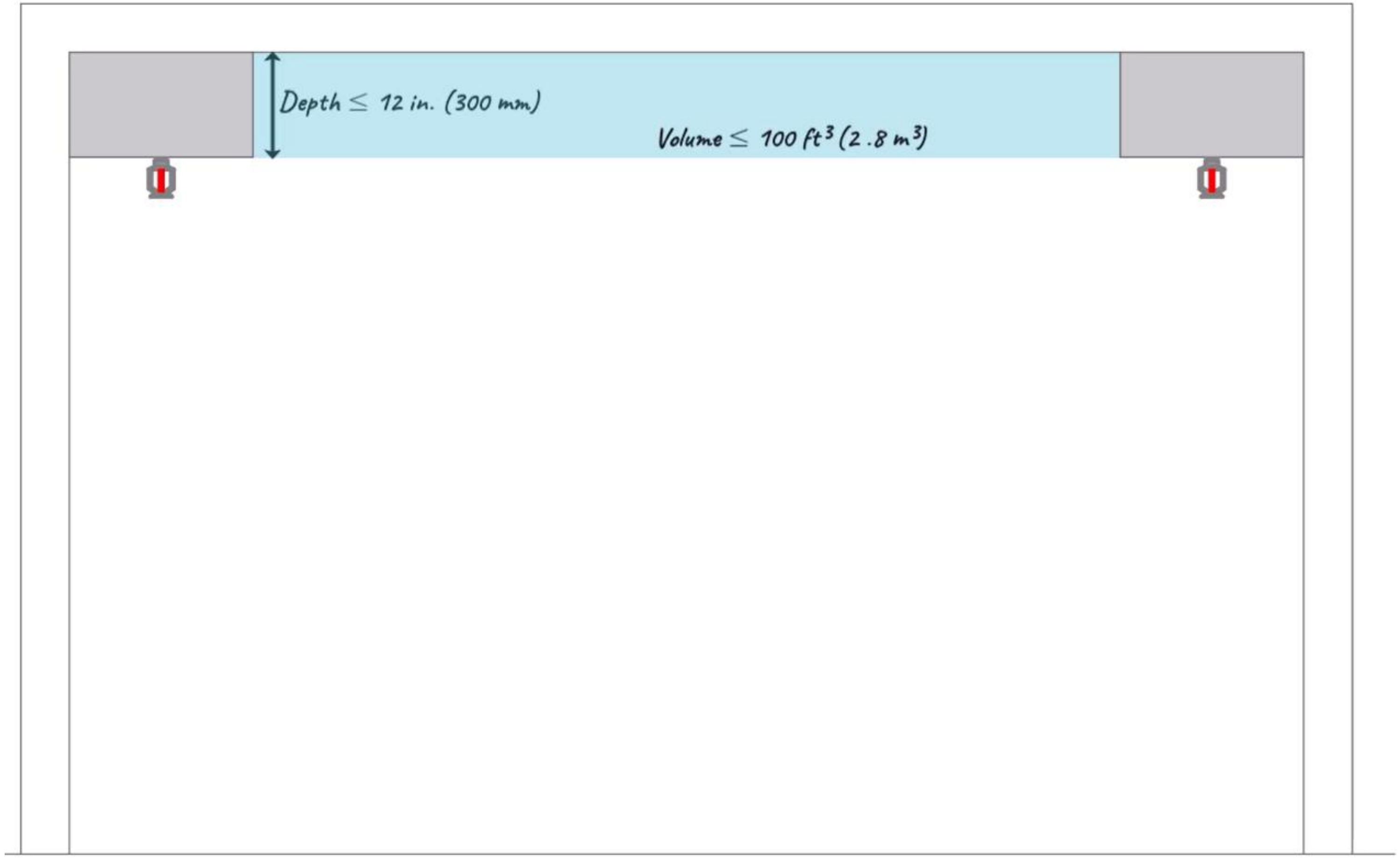
YouTube

NSV
NSVSOFT.NET

Ceiling Pocket Requirements



Ceiling Pocket Requirements



Cloud Ceiling

BRIEF OVERVIEW

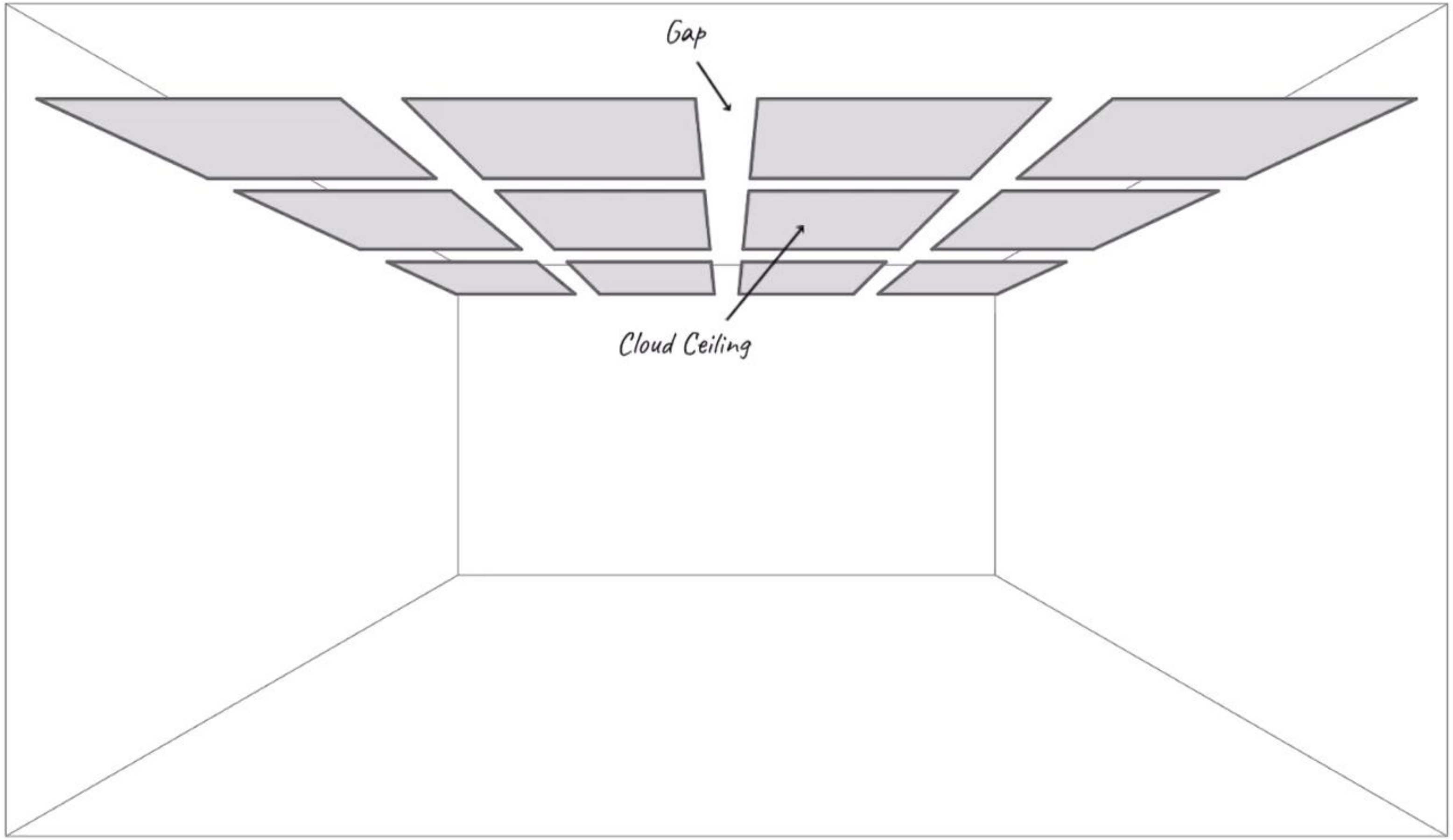
Cloud Ceiling

A cloud ceiling is a horizontal ceiling in a single plane with open gaps to above on at least two sides. NFPA 13 (2016) introduced cloud ceiling provisions; in 2025, Section 9.2.7 details when sprinklers above may be omitted.

The key control is Table 9.2.7.1, which sets the maximum allowable coverage area for sprinklers installed below cloud ceilings, based on the minimum panel width and ‘X’—the ratio of gap width to ceiling height.

NSVCad’s cloud tool prompts for gap width, panel width, and height, calculates compliance, and identifies when upper cloud sprinklers can be omitted, ensuring efficient, NFPA-compliant design.

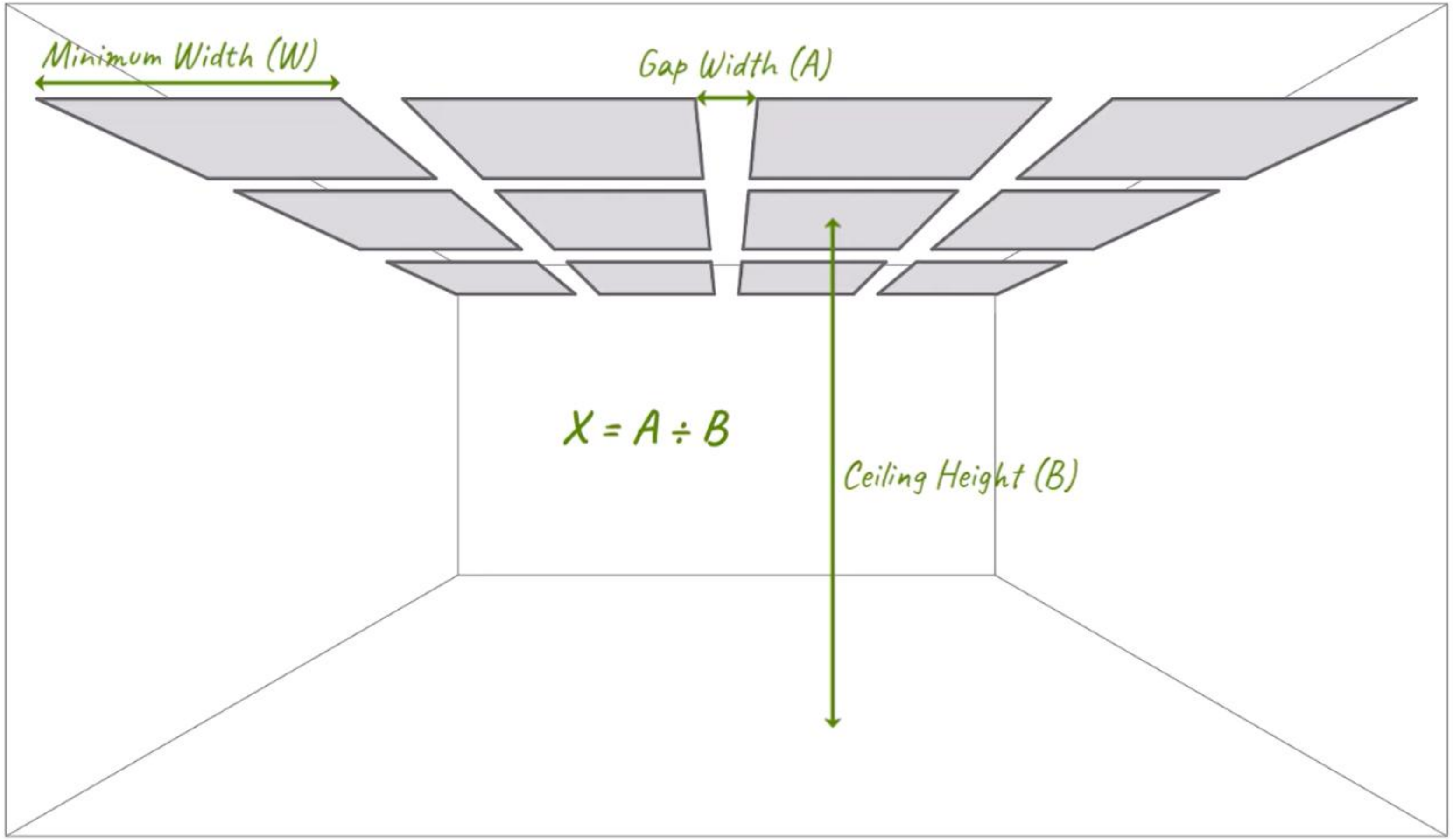
Definition



YouTube

NSVSOFT.NET

Panel Width and ‘X’



Open Grid Ceiling

BRIEF OVERVIEW

Open Grid Ceiling

Open grid ceilings offer both aesthetic appeal and functional flexibility. Under NFPA 13, sprinklers may be installed only above the grid if three specific criteria are met:

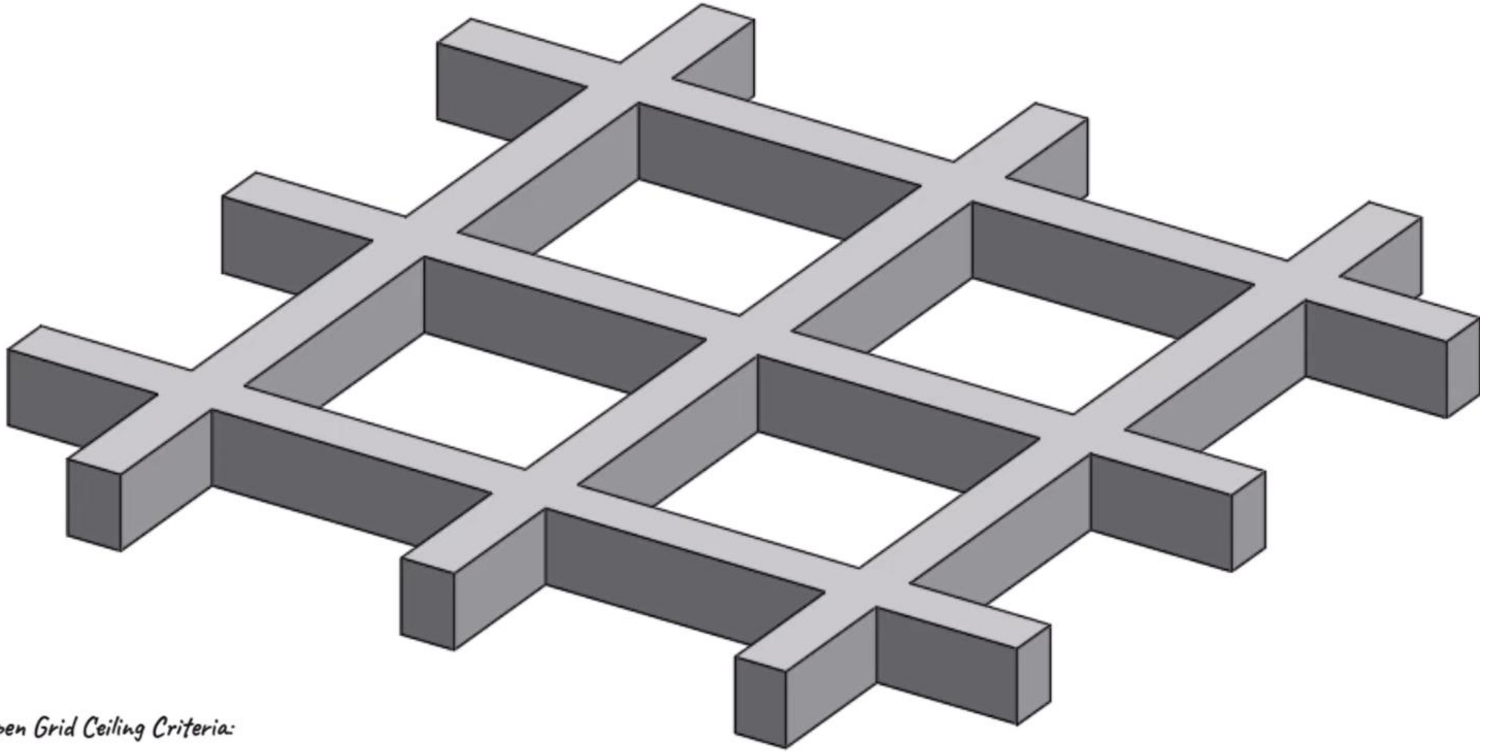
- Least opening dimension ≥ ¼ in.
- Ceiling thickness ≤ Least opening dimension
- Open area ≥ 70%

Even when qualified, grids can affect heat rise and spray distribution, so sprinkler spacing depends on clearance between the deflector and ceiling.

NSVCad tools measure openings, check NFPA criteria, and flag noncompliance.

OPEN GRID CEILING CRITERIA

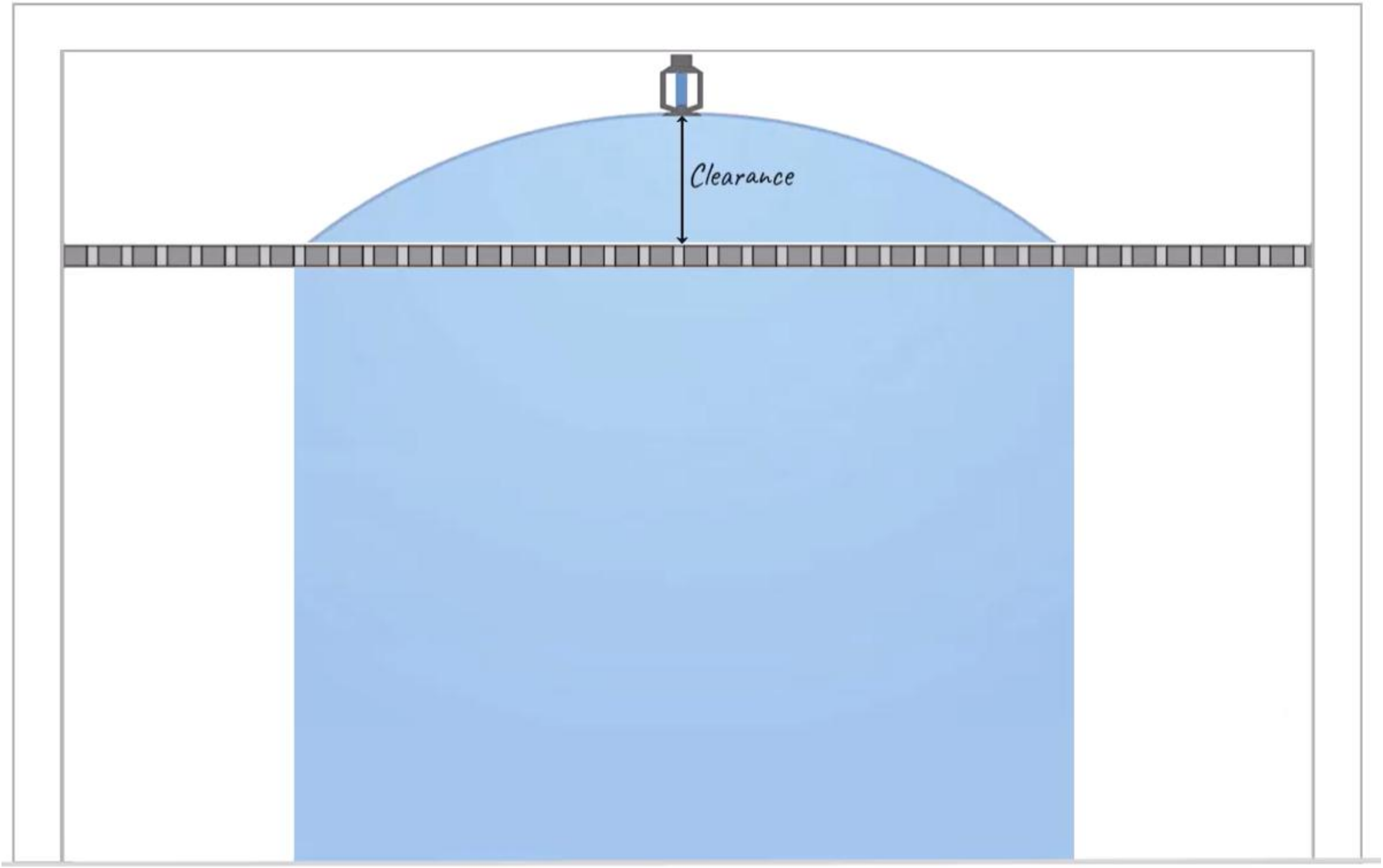
Least Dimension, Thickness and Openness



Open Grid Ceiling Criteria:

1. If $C < d$, then 'C' is the least dimension → 'C' must be 1/4 in. (6 mm) or more
2. If $C < d$, then 'C' is the least dimension → 'Thickness must not exceed 'C'
3. Openings constitute at least 70% of the ceiling surface area

Effect of Open Grid Ceilings on Spacing



Heat Sources

Sprinkler Safe Spacing

NSVSOFT.NET

BRIEF OVERVIEW

Heat Sources

This video explains NFPA 13, 13R, and 13D guidelines for minimum sprinkler clearance from residential heat sources to prevent accidental activation. Using reference tables, we compare ordinary and intermediate temperature sprinklers. The video demonstrates how to visualize clearance zones around heat sources.

NSVCad software highlights intermediate and non-permitted zones in real time, updates sprinkler temperature ratings, and prevents placement violations

YouTube

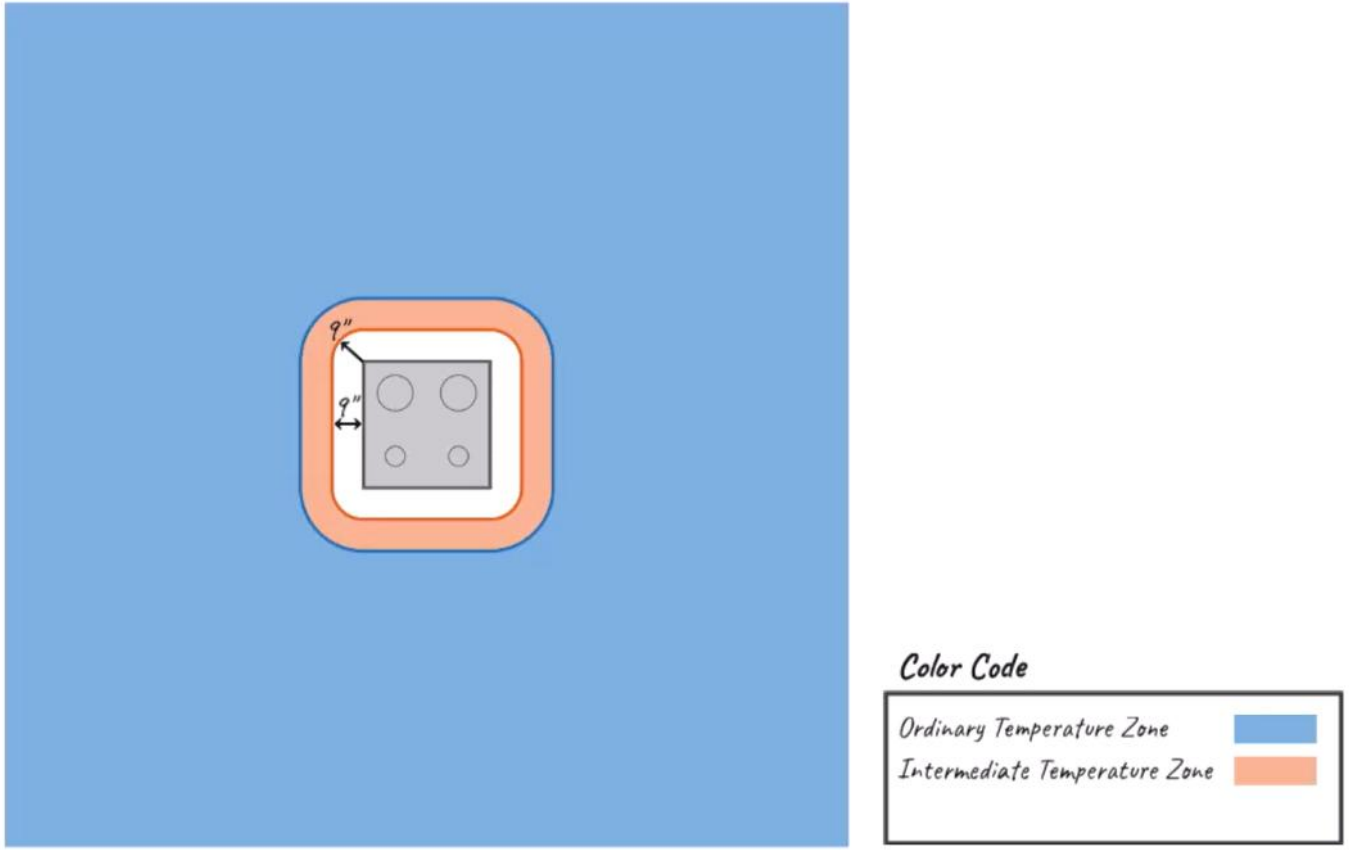
NSV
NSVSOFT.NET

Heat Sources in Residential Areas

Heat Source	Ordinary Temperature Sprinkler	Intermediate Temperature Sprinkler
Kitchen range	18 in. (450 mm)	9 in. (225 mm)
Wall oven	18 in. (450 mm)	9 in. (225mm)
Open Fireplace	36 in. (900 mm)	12 in. (300 mm)
Side of Recessed Fireplace	36 in. (900 mm)	12 in. (300 mm)
Front of Recessed Fireplace	60 in (1500 mm)	36 in. (900 mm)
Light fixture (except LED)		
0 - 250 W	6 in. (150 mm)	3 in. (75 mm)
250- 499 W	12 in. (300 mm)	6 in. (150 mm)
And, ...		

Minimum Distance from the Edge of the Heat Source

Ordinary and Intermediate Temperature Zones



Contact Information

CONTACT INFORMATION

Presented by: Hesam Tavoosi, FPE, CFPS, CWBSP, CSITMS, Approved NFPA Instructor

Email: Hesam@nsvsoft.net

WhatsApp: +971585220544

YouTube NSVCad

www.NSVsoft.net

NSVSOFT.NET