tyco / Fire & Building Products

Technical Services: Tel: (800) 381-9312 / Fax: (800) 791-5500

BB (Back to Back), SD (Single Directional), and HIP Specific Application Attic Sprinklers, Quick Response Extended Coverage Spacing

General Description

The Specific Application Attic Sprinklers are fire sprinklers for combustible and non-combustible sloped attic spaces. The Specific Application Attic Sprinklers provide superior fire protection in attic spaces, and when compared to spray sprinklers, cost savings are achieved by eliminating branchline materials and the associated installation labor. The Specific Application Attic Sprinklers have undergone the most extensive fire testing ever performed for sloped attic spaces. They are UL Listed with their specific application guidelines for use as special sprinklers as defined by the NFPA.

The Specific Application Attic Sprinklers provide an extended coverage spacing alternative to the restricted spacing of standard spray sprinklers. The restricted spacings of standard spray sprinklers used within attics is described in the 2002 edition of NFPA 13, Table 8.6.2.2.1(a) and Section 8.6.4.1.4.

The Specific Application Attic Sprinklers are the first sprinklers to be:

- Listed for extended coverage in combustible construction.
- Full-scale fire tested in both wet and dry system scenarios.
- Full-scale tested, for use in wood truss construction.
- Listed for specific roof slopes from 4:12 to 12:12.

IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.

The Specific Application Attic Sprinklers provide the best level of protection and control cost by eliminating the need for additional sprinklers and branchline piping. In many cases, an attic can be entirely protected with just one line of piping located below the peak of the roof using Model BB (Back to Back) Sprinklers. If there is a need for Model SD (Single Directional) or Model HIP Sprinklers, one line of either of these sprinkler types is sufficient at each area being covered. For example and assuming the use of standard sprinklers, a system in a 60 foot (18,3 m) wide attic, with up to a 12:12 roof pitch, designed to the 2002 edition of NFPA 13, would require seven branch lines to cover the main portion of the attic and several additional branch lines to cover the hip areas. With the Specific Application Attic Sprinklers, the required coverage can be obtained with just one branchline running below the peak and one down each slope of the hip beam. This would result in approximately 90% less pipe needed for installation. This reduction in the number of branch lines saves the cost of the pipe, fittings, hangers, and associated labor by eliminating up to five branch lines.

Another important aspect of the Specific Application Attic Sprinkler technology is the reduction in system volume. This volume reduction may result in reducing the size of a dry pipe valve (and air compressor) and possibly allow for quicker water delivery times, eliminating the need for an accelerator.

The other cost reduction is the Listing of BlazeMaster* CPVC for use in attic spaces to feed the wet system attic sprinklers, as well as to feed the wet system sprinklers below the ceiling. Traditionally BlazeMaster CPVC has

*Noveon Registered Trademark

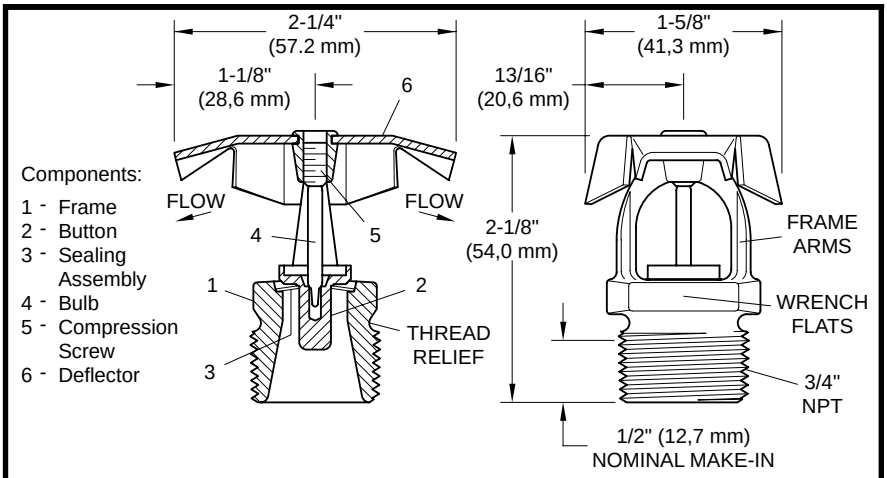


FIGURE A
MODEL BB1, BB2 & BB3 WITH 8.0 K-FACTOR
SPECIFIC APPLICATION ATTIC SPRINKLERS

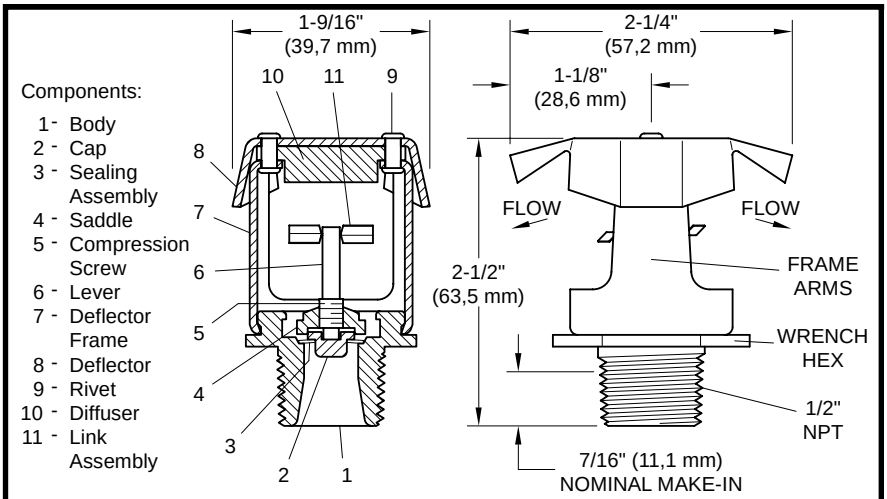


FIGURE B
MODEL BB1, BB2 & BB3 WITH 5.6 K-FACTOR
SPECIFIC APPLICATION ATTIC SPRINKLERS

been used on the lower floors in the joist space above a ceiling that do not require sprinklers. The cost of using CPVC on those floors can now be translated to the upper floor even if sprinklers are required in the attic.

There are three (3) models of the Specific Application Attic Sprinklers — BB (Back to Back Dual Directional), SD (Single Directional), and HIP. The BB (Back to Back) and SD (Single Directional) Sprinklers have three separate versions that are used for different roof pitches. The pitches can vary from a minimum of 4:12 to a maximum of 12:12.

BB Sprinkler (Back to Back Dual Directional)
The Model BB Specific Application Attic Sprinkler (Figure A & B) throws a narrow but long pattern. The narrow spacing along the ridge serves two purposes. The response time is reduced by placing the sprinklers no farther than 6 feet (1,8 m) apart, and the spray can be concentrated in the throw direction to obtain a pattern that will cover up to 30 feet (9,1m) in each direction when measured horizontally. There are three different models (i.e., BB1, BB2 & BB3) that account for different roof slopes, and each model is provided in one of two different orifice sizes (K=5.6 & K=8.0).

SD Sprinkler (Single Directional)
The Model SD (Single Directional) Specific Application Attic Sprinkler (Figure C) like the Model BB throws a narrow but long pattern. However, unlike the Model BB the Model SD only throws in one direction. These sprinklers are primarily used where shear walls or draft curtains have been installed within an attic space. Another use is when the framing direction is parallel with the outside wall in the hip area (Ref. Figure 11). In this case, the SD (Single Directional) would be used on one side of the slope and standard sprinklers would be used to protect the other side. The Model SD Sprinklers must be installed in a vertical upright orientation and not angled with the slope. (Achieving the vertical upright orientation may require the use of a swing joint if the SD Sprinklers are being fed from a line running along and parallel to the roof hip.) There are three different models (i.e., SD1, SD2 & SD3) that account for different roof slopes.

HIP Sprinkler
The HIP Specific Application Attic Sprinkler (Figure D) covers the area of the hip in the attic. This is a slightly different concept than the BB (Back to Back) or SD (Single Directional). The HIP Sprinkler is located along the slope running down the hip, and throws a 90° pattern toward the outside eaves. This pattern allows the water to “corner” and control the fire. The HIP does not throw much water directly up or down the hip but rather it throws most of the pattern out to each side (90°) down the slope of the roof. This sprinkler is typically spaced 6 feet (1,8 m) to 3 feet (0,9 m) on center down the slope. To use the HIP Sprinkler, the framing must be perpendicular to the outside wall (Ref. Figure 12) and the maximum throw cannot exceed 28 feet (8,5 m) measured horizontally. The HIP, unlike the BB (Back to Back) and SD (Single Directional), is installed with the deflector parallel with the slope. There is only one model with flows and pressures for two different spacings.

WARNING
The Specific Application Attic Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National

Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. ***Failure to do so may impair the performance of these devices.***

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or manufacturer should be contacted with any questions.

Sprinkler Identification Number

TY4180 - BB1, K=8.0
TY4181 - BB2, K=8.0
TY4182 - BB3, K=8.0
TY3180 - BB1, K=5.6
TY3181 - BB2, K=5.6
TY3182 - BB3, K=5.6
TY3183 - SD1, K=5.6
TY3184 - SD2, K=5.6
TY3185 - SD3, K=5.6
TY3187 - HIP, K=5.6

The "TY" prefix is a redesignation of the previous "C" prefix (e.g., TY4180 is a redesignation for C4180).

Technical Data

Approvals
UL & C-UL Listed.
(The approvals only apply to the service conditions indicated in the Design Criteria section on Page 6 and the Design Guidelines section on Page 7.)

Pipe Thread Connection
1/2 inch NPT for K=5.6
3/4 inch NPT for K=8.0

Discharge Coefficient
K = 5.6 GPM/psi$^{1/2}$
(80,6 LPM/bar$^{1/2}$)
K = 8.0 GPM/psi$^{1/2}$
(115,5 LPM/bar$^{1/2}$)

Temperature Rating
200°F/93°C for BB (Back to Back) with K=8.0 and HIP
212°F/100°C for BB (Back to Back) with K=5.6 and SD (Single Directional)

Finish
Natural Brass

Physical Characteristics (Figures A & D)
Frame . . . . . Bronze
Button . . . . . Bronze/Copper
Sealing Assembly . . . . . Beryllium Nickel w/Teflon†
Bulb . . . . . Glass (3 mm dia.)
Link . . . . . Monel
Compression Screw . . . . . Brass
Deflector . . . . . Brass/Bronze
† DuPont Registered Trademark

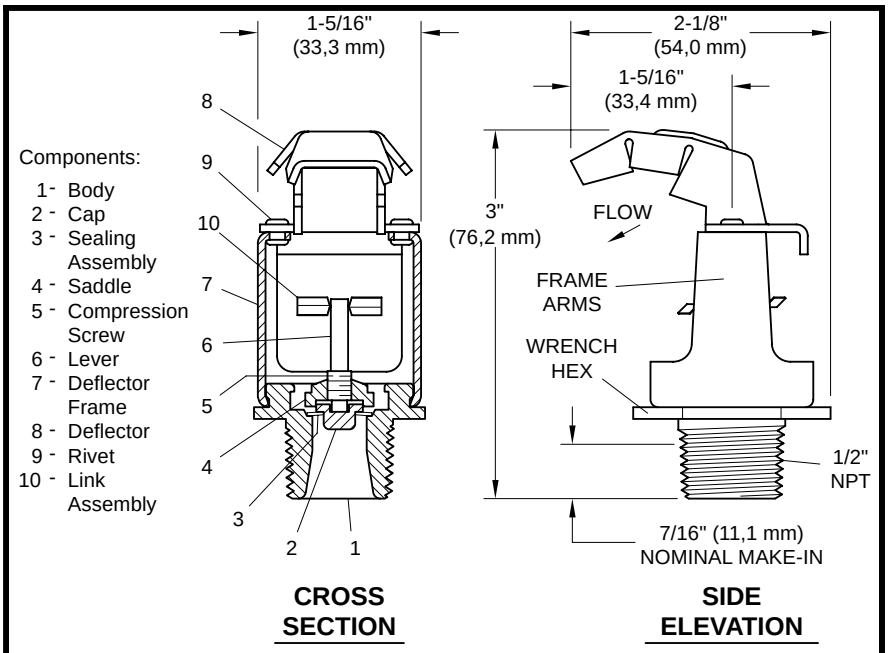


FIGURE C
MODEL SD1, SD2 & SD3 WITH 5.6 K-FACTOR
SPECIFIC APPLICATION ATTIC SPRINKLERS

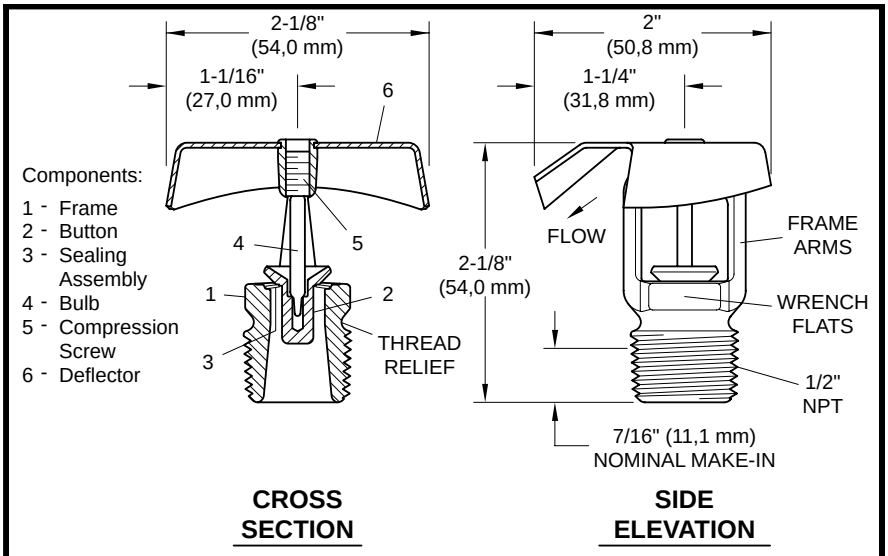


FIGURE D
MODEL HIP WITH 5.6 K-FACTOR
SPECIFIC APPLICATION ATTIC SPRINKLER

Physical Characteristics (Figures B & C)
Body . . . . . Brass
Cap . . . . . Bronze
Sealing Assembly . . . . . Beryllium Nickel w/Teflon†
Saddle . . . . . Brass
Link Assembly . . . . . Nickel
Compression Screw . . . . . Brass
Deflector . . . . . Brass/Bronze
Lever . . . . . Bronze
Deflector Frame . . . . . Bronze
Diffuser . . . . . Brass
Rivet . . . . . Brass
† DuPont Registered Trademark

Patents
U.S.A. 5,669,449

Operation

BB (K=8.0) & HIP (K=5.6)
The glass bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb, allowing the sprinkler to activate and water to flow.

BB (K=5.6) & SD (K=5.6)
The fusible link assembly is comprised of two link halves which are joined by a thin layer of solder. When the rated temperature is reached, the solder melts and the two link halves separate, allowing the sprinkler to activate and water to flow.

Installation

The Specific Application Attic Sprinklers must be installed in accordance with the following instructions:

NOTES
With reference to Figure E, do not grasp the sprinkler by the deflector.

Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm).

A leak tight 1/2 inch NPT sprinkler joint should be obtained with a torque of 7 to 14 ft.lbs. (9,5 to 19,0 Nm). A maximum of 21 ft.lbs. (28,5 Nm) of torque is to be used to install 1/2 inch NPT sprinklers. A leak tight 3/4 inch NPT sprinkler joint should be obtained with a torque of 10 to 20 ft.lbs. (13,4 to 26,8 Nm). A maximum of 30 ft.lbs. (40,7 Nm) of torque is to be used to install 3/4 inch NPT sprinklers. Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.

Step 1. All Specific Application Attic Sprinklers must be oriented correctly:

- Model BB Sprinklers are to be installed in the upright vertical position with the flow arrows on the deflector pointing down the two opposing slopes.
- Model SD Sprinklers are to be installed in the upright vertical position with the flow direction arrow on the deflector pointing down the slope.
- The Model HIP Sprinklers are to be installed with the deflector at the top and with the sprinkler centerline perpendicular to the ridge of the hip roof and with the flow direction arrows on the deflector pointing down the two opposing slopes. (Unlike the Model BB and Model SD, the Model HIP is installed angled so that its deflector is parallel with the slope of hip ridge line.)

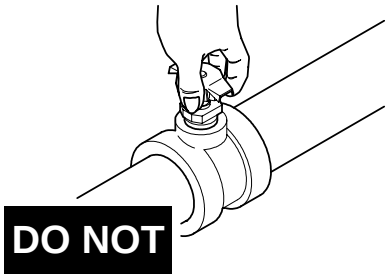


FIGURE E
DO NOT GRASP DEFLECTOR

Step 2. With pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting. ***With reference to Figure E, do not grasp the sprinkler by the deflector.***

Step 3. Wrench tighten the sprinkler using only the following wrenches:

BB (K=8.0) - W-Type 3 (End A) Sprinkler Wrench (Figure F)

HIP (K=5.6) - W-Type 20 (End A) Sprinkler Wrench (Figure G)

BB (K=5.6) & SD (K=5.6) - use an open end adjustable wrench (Figure H).

Wrenches are only to be applied to the sprinkler wrench flats or wrench hex, as applicable (Ref. Figures A, B, C, and D).

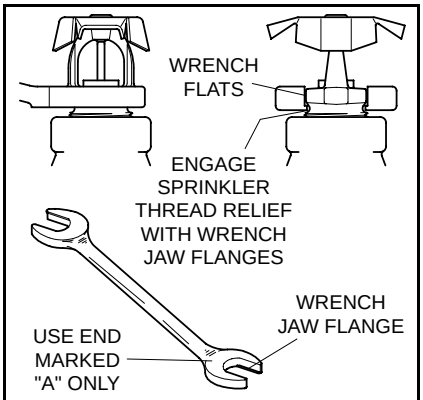


FIGURE F
W-TYPE 3 SPRINKLER WRENCH
For use with BB (K=8.0) Sprinklers

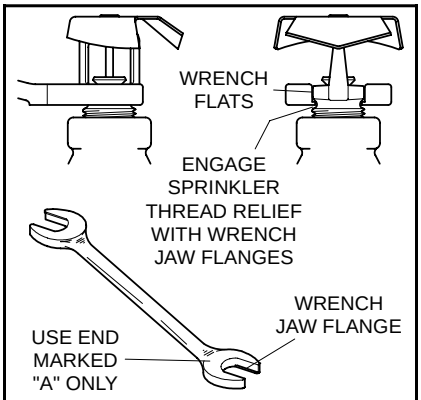


FIGURE G
W-TYPE 20 SPRINKLER WRENCH
For use with HIP (K=5.6) Sprinklers

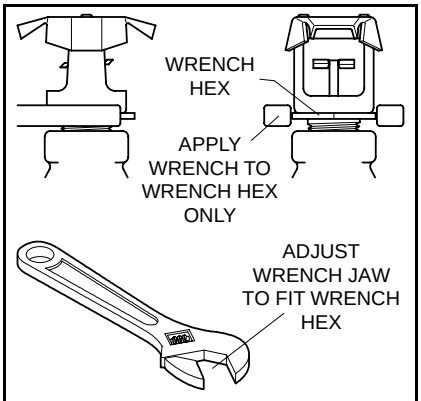


FIGURE H
ADJUSTABLE WRENCH
For use with BB (K=5.6) & SD (K=5.6) Sprinklers

SPRINKLER TYPE	K-FACTOR	SIN	ALLOWABLE ROOF SPAN [(a) (b)] Feet (m)	FLOW GPM (lpm)	PRESSURE PSI (bar)	PITCH Rise Over Run (%)
BB1	8.0	TY4180	≤60 (18,3)	38 (144)	22.6 (1,5)	4:12 (33) to less than 7:12 (58)
BB2	8.0	TY4181	≤60 (18,3)	38 (144)	22.6 (1,5)	7:12 (58) to less than 10:12 (83)
BB3	8.0	TY4182	≤60 (18,3)	40 (152)	25.0 (1,7)	10:12 (83) to 12:12 (100)
BB1	5.6	TY3180	>40 (12,2) to ≤60 (18,3)	38 (144)	46.0 (3,2)	4:12 (33) to less than 7:12 (58)
BB2	5.6	TY3181	>40 (12,2) to ≤60 (18,3)	38 (144)	46.0 (3,2)	7:12 (58) to less than 10:12 (83)
BB3	5.6	TY3182	>40 (12,2) to ≤60 (18,3)	38 (144)	46.0 (3,2)	10:12 (83) to 12:12 (100)
BB1	5.6	TY3180	≤40 (12,2)	25 (95)	20.0 (1,4)	4:12 (33) to less than 7:12 (58)
BB2	5.6	TY3181	≤40 (12,2)	25 (95)	20.0 (1,4)	7:12 (58) to less than 10:12 (83)
BB3	5.6	TY3182	≤40 (12,2)	25 (95)	20.0 (1,4)	10:12 (83) to 12:12 (100)
SD1	5.6	TY3183	>30 (9,1) to ≤40 (12,2)	35 (132)	39.0 (2,7)	4:12 (33) to less than 7:12 (58)
SD2	5.6	TY3184	>30 (9,1) to ≤40 (12,2)	35 (132)	39.0 (2,7)	7:12 (58) to less than 10:12 (83)
SD3	5.6	TY3185	>30 (9,1) to ≤40 (12,2)	35 (132)	39.0 (2,7)	10:12 (83) to 12:12 (100)
SD1	5.6	TY3183	>10 (3,0) to ≤30 (9,1)	25 (95)	20.0 (1,4)	4:12 (33) to less than 7:12 (58)
SD2	5.6	TY3184	>10 (3,0) to ≤30 (9,1)	25 (95)	20.0 (1,4)	7:12 (58) to less than 10:12 (83)
SD3	5.6	TY3185	>10 (3,0) to ≤30 (9,1)	25 (95)	20.0 (1,4)	10:12 (83) to 12:12 (100)
SD1	5.6	TY3183	≤10 (3,0)	19 (72)	11.5 (0,8)	4:12 (33) to less than 7:12 (58)
SD2	5.6	TY3184	≤10 (3,0)	19 (72)	11.5 (0,8)	7:12 (58) to less than 10:12 (83)
SD3	5.6	TY3185	≤10 (3,0)	19 (72)	11.5 (0,8)	10:12 (83) to 12:12 (100)
HIP	5.6	TY3187	>20 (6,1) to ≤28 (8,5)	34 (129)	36.9 (2,5)	4:12 (33) to 12:12 (100)
HIP	5.6	TY3187	≤20 (6,1)	25 (95)	20.0 (1,4)	4:12 (33) to 12:12 (100)

NOTES:
(a) The BB and SD roof span is measured horizontally (not along the slope) as shown in Figure 1 and 2.
(b) The HIP roof span is measured as shown in Figure 12.

TABLE A
ALLOWABLE ROOF SPAN, FLOW, PRESSURE, AND PITCH FOR SPECIFIC APPLICATION ATTIC SPRINKLERS

Design Criteria

Area Of Use:
Roof structures, combustible and noncombustible, including wood joist/rafters and wood trussed attics, with a ceiling below.

System Type:
Wet using CPVC pipe.
Wet or dry using steel pipe.

Hazard:
Light hazard.

Allowable Roof Span (Coverage):
Refer to Table A for allowable roof spans, as well as for the associated minimum sprinkler flows and pressures. Figures 1, 2 & 12 illustrate where the roof span is to be measured. The roof span may be measured at the top of noncombustible insulation (Ref. Figure 13). Roof spans may be up to 80 feet (24,2 m) by using additional standard spray sprinklers (Ref. Figures 14 & 15).

Minimum Distance Between Attic Sprinklers:
4 feet (1,2 m) as measured along branchline for BB and SD (Ref. Figure 3). 3 feet (0,9 m) as measured along branch line for HIP (Ref. Figure 12).

Maximum Distance Between Attic Sprinklers:
6 feet (1,8 m) on center along the branch line (Ref. Figure 3 and 12).

Minimum Distance Between Standard and Attic Sprinklers:
6 feet (1,8 m) as measured along the peak/ridge direction (Ref. Figure 4) and 26 feet (7,9 m) in the slope direction for BB and HIP versions (Ref. Figure 6).

Deflector Installation Position Below Peak/Ridge or Deck:
22 inches (558,8 mm) maximum, 16 inches (406,4 mm) minimum (Ref. Figures 2 and 5).

Deflector Installation Position Above Scissor Truss
18 inches (457,2 mm) minimum.

Minimum Distance Away From Trusses:
Attic Sprinklers must be installed 6 inches (152,4 mm) away from the face of trusses (Ref. Figure 7).

Distance From SD To Shear Wall Or Draft Curtain:
4 to 6 inches (101,6 to 152,4 mm) from face, and minimum 8 inches (203,2 mm) above bottom of draft curtain (Ref. Figure 2).

Draft Curtains:
Draft curtains installed to permit the installation of Attic Sprinklers shall be constructed so as to not allow heat to escape through or above the draft curtain. The draft curtain may be constructed of 1/2 inch (12,7 mm) plywood.

Maximum Distance For BB Or HIP Sprinklers From The Center Line Of The Ridge:
6 inches (152,4 mm) (Ref. Figure 8) with the deflector located 16 inches (406,4 mm) to 22 inches (558,8 mm) from the peak.

UL Listed Use Of BlazeMaster CPVC Piping With Specific Application Attic Sprinklers:
TFP BlazeMaster CPVC piping my be used in a combustible concealed attic space requiring sprinklers when installed in accordance with the following guidelines:

- TFP BlazeMaster CPVC may be used to feed the wet system ceiling sprinklers on the floor below, there must be 6 inches (152,4 mm) of insulation covering the pipe extending 12 inches (304,8 mm) on each side away from the centerline of the pipe, and the area above the CPVC must be protected by TFP Specific Application Attic Sprinklers (Ref. Figure 9A). If the pipe is located inside the ceiling joist, the joist channel must be covered or filled with 6 inches (152,4 mm) of non-combustible insulation on top of the pipe and the area above must be protected by Attic Sprinklers (Ref. Figure (9B). Insulation is for fire protection purposes. It is not freeze protection. BlazeMaster CPVC must be installed in accordance with the BlazeMaster installation guide instructions.
- TFP BlazeMaster CPVC may be used exposed to feed wet system specific application attic sprinklers (BB, SD, or HIP) where a minimum lateral distance of 18 inches (450 mm) is maintained between the CPVC pipe and a heat producing device such as heat pumps, fan motors, and heat lamps.
- TFP BlazeMaster CPVC may be used exposed to feed specially listed combustible concealed space sprinklers (Ref. Figures 11 and 15) when the combustible concealed space sprinklers are installed in accordance with their listing limitations.

Mismatched Slopes:
For mismatched slopes refer to Figure 10.

Obstructions:
Refer to Figure 16. (For guidance on the size of piping to which a Specific Application Attic Sprinkler can be directly attached, reference NFPA 13 - 2002 Section 8.8.5.2.1.7).

Hydraulic Requirements:
For hydraulic requirements refer to Figure 17.

To Determine The Correct Flow And Pressure:
Determine the roof span (measured horizontally) and the slope of the roof, and then refer to Table A. There is no interpolation of the flow and pressure shown. Round all cases to the next higher spacing. For example, a 45 feet (13,7 m) span with the BB1 (K=8.0) would be calculated at the 60 feet (18,3 m) span.

Maximum Coverage Area:
400 square feet (37,2 m^2).

Spacing for **BB (Back to Back) Attic Sprinklers** is determined by twice the distance of the furthest throw measured along the slope, multiplied by the distance along the branchline (maximum distance along branch line is 6 feet (1,8 m) regardless of the length of the throw).

NOTE
The distance along the branchline may have to be reduced to less than the maximum of 6 feet (1,8 m) to remain under 400 ft^2 (37,2 m^2) maximum depending on the slope and the span. In no case can the span exceed 60 feet (18,3 m) without additional standard spray sprinklers.

Spacing for the **SD (Single Directional) Attic Sprinklers** is the distance along the branchline multiplied by the distance of the throw down the slope. Regardless of the throw, the maximum distance along the branchline is 6 feet (1,8 m) the maximum throw, measured horizontally is 40 feet (12,2 m), and the maximum spacing per sprinkler is 400 ft^2 (37,2 m^2).

Spacing for the **HIP Attic Sprinklers** is the distance down the larger slope multiplied by two, and multiplied by the distance between the sprinklers as measured along the slope of the hip.

Design Guidelines

To design a project with attic sprinklers use these steps as a guideline:

- Determine if single, dual directional or hip sprinkler is needed.
- Determine the roof slope is between 4:12 to 12:12. If more than one slope is being used on a project, select the correct sprinkler for each area.
- Follow the guidelines for each type of sprinkler.
- Calculate the sprinkler system in accordance with the appropriate flow and pressure information provided in Table A, as well as Figure 17. There is no interpolation of the flows and pressures shown on the chart.

For BB Sprinklers (Back to Back Dual Directional)

- Determine the throw needed (see spacing requirements in Table A). If over 20 feet (6,1 m) and up to 60 feet (18,3 m) is required, use the 8.0 K-factor, BB Sprinklers to reduce the pressure required. If pressure is not a concern, use the 5.6 K-factor, Back to Back Sprinklers to minimize over discharge.
- If less than 20 feet (6,1 m) is required, use the 5.6 K-factor, Back to Back dual directional to minimize pressure and flow requirements
- Determine the distance along the slope. If the distance is not equal, use the longer side. Multiply the longer side by two to determine the spacing down the slope. Four hundred divided by this value will determine the maximum spacing along the ridge. The maximum distance is 6 feet (1,8 m). For example, a 12:12 slope at the maximum span of 60 feet (18,3 m) will produce a slope length of approximately 42.5 feet (13,0 m). That number multiplied by two produces an 85 feet (25,9 m) throw. Four hundred square feet maximum divided by an 85 feet (25,9 m) throw only allows a 4 feet - 8 inches (1,4 m) spacing along the ridge. Using the maximum spacing, space the sprinklers along the ridge.
- Avoid obstructions as shown in Figure 16. If necessary, add standard sprinklers to maintain coverage around obstructions.

For SD Sprinklers (Single Directional)

- Determine the throw needed.
- As the 400 ft^2 (37,2 m^2) is not a factor with the SD Sprinklers, the maximum spacing is 6 feet (1,8 m) and the minimum is 4 feet (1,2 m) (Ref. Figures 2 &11). (The reason 400 ft^2 is not an issue with the single directional is because at its maximum spacing, 6 feet (1,8 m)on center/covering 40 feet (12,2 m) flat / a 12:12 slope / and the throw being 56.5 feet (17,2 m), the 400 ft^2 (37,2 m2) maximum would not be exceeded.)
- Avoid obstructions as shown in Figure 16. If necessary, add standard sprinklers to maintain coverage around obstructions.

For HIP Sprinklers

- Verify framing direction is perpendicular to outside wall (Ref. Figures 11 & 12). If not, cover that area with standard sprinklers.
- From the intersection of the top of the hip and the ridge the maximum distance down the slope of the hip is 3 feet (0,9 m). Start the layout with the first sprinkler as close to that point as possible, but no further, while staying 6 inches (152,4 mm) away from the face of the trusses. Remember the slope of the hip is not equal to the slope of the roof from the ridge to the outside wall. Continue to space sprinklers down the hip at a maximum of 6 feet (1,8 m) on center as measured along the slope of the hip. When the bottom of the hip is encountered, the last sprinkler must be within 7-1/2 feet (2,3 m) of the outside wall as measured flat (plan view). If this pipe is “cut to fit” remember to account for the different slopes of the hip and the roof as well as distances measured along the slope verses horizontal in plan view.
- Avoid obstructions as shown in Figure 16. If necessary, add standard sprinklers to maintain coverage around obstructions.

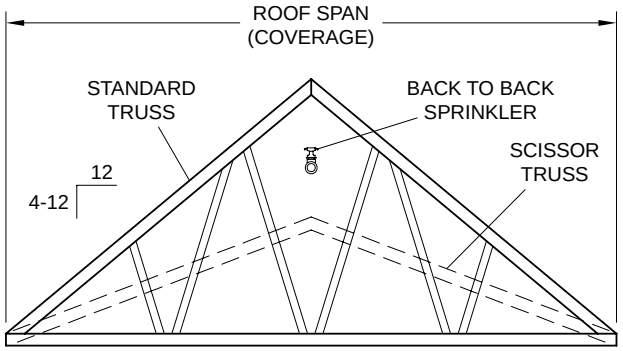


FIGURE 1

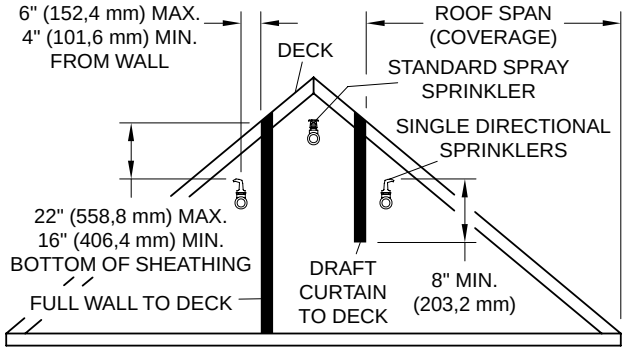


FIGURE 2

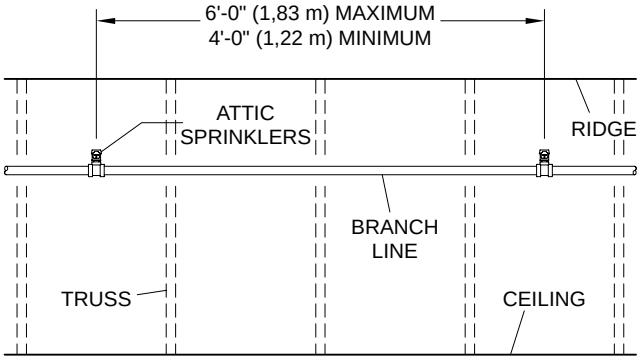


FIGURE 3

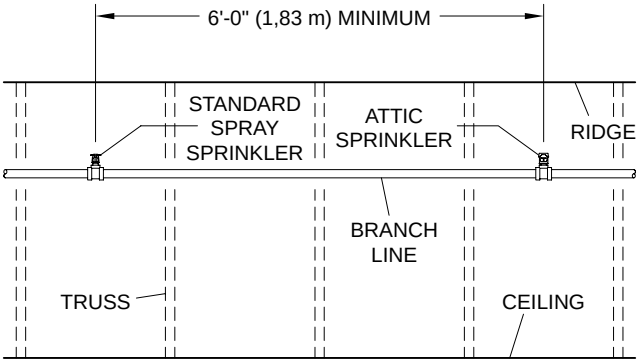


FIGURE 4

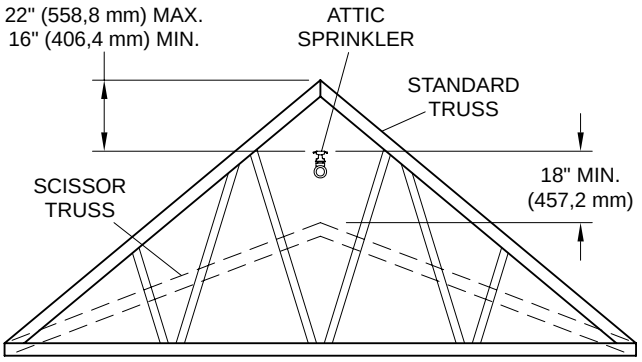


FIGURE 5

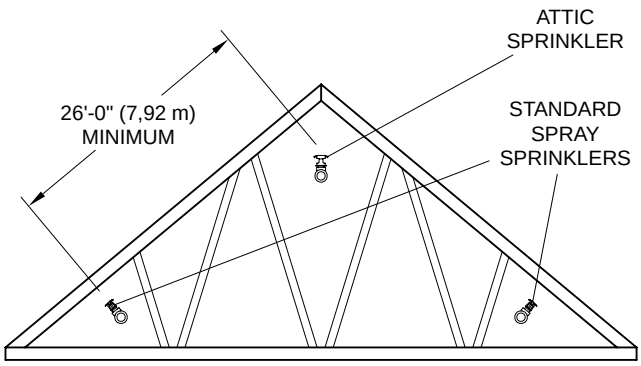


FIGURE 6

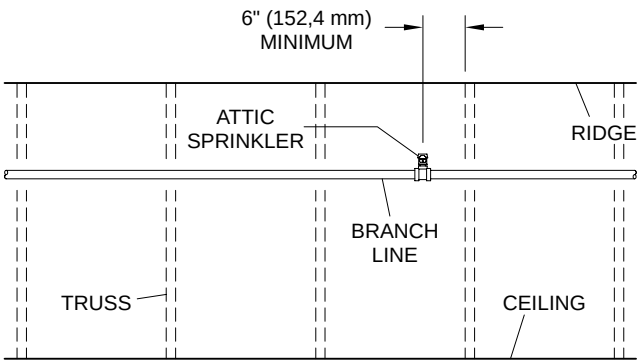


FIGURE 7

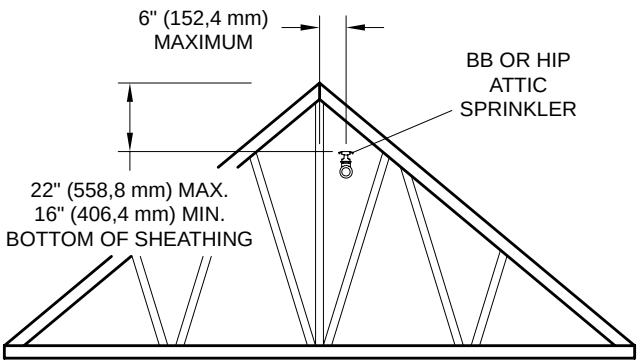


FIGURE 8

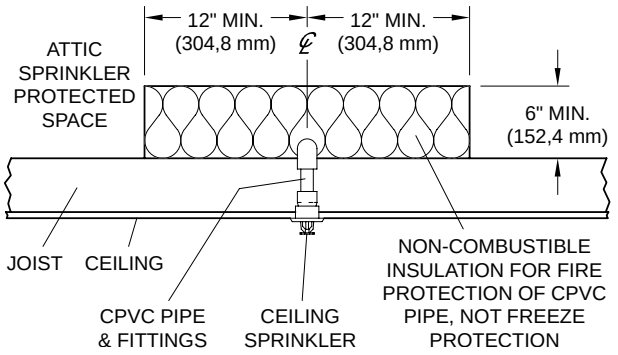


FIGURE 9A

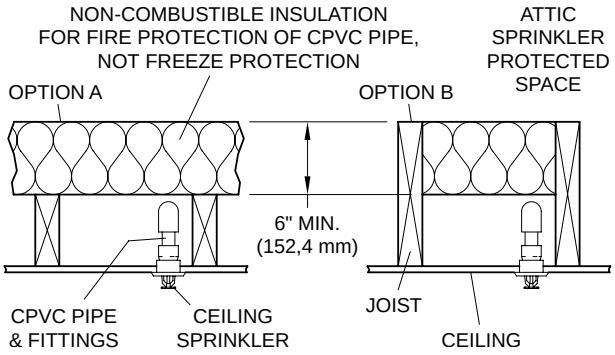


FIGURE 9B

FIGURE 10
Permitted Use Of Attic Sprinklers For Mismatched Slopes

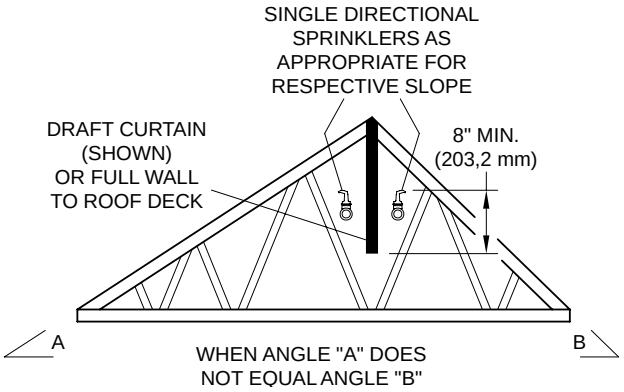
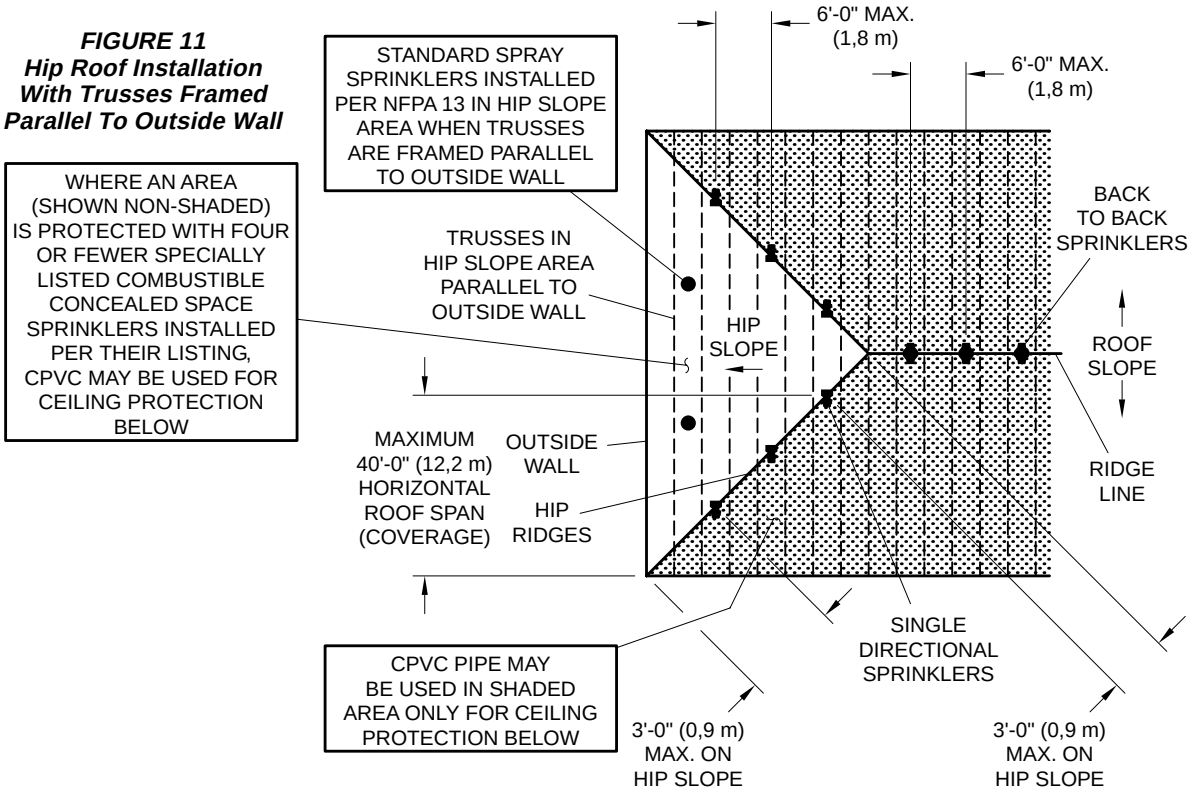


FIGURE 11
Hip Roof Installation With Trusses Framed Parallel To Outside Wall



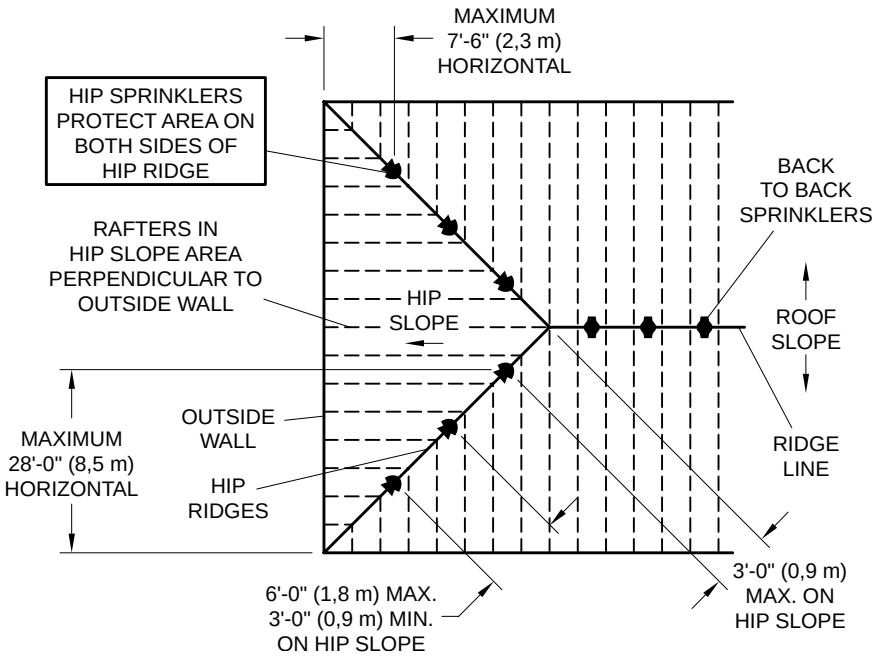


FIGURE 12
Hip Roof Installation
With Rafters Framed Perpendicular To Outside Wall

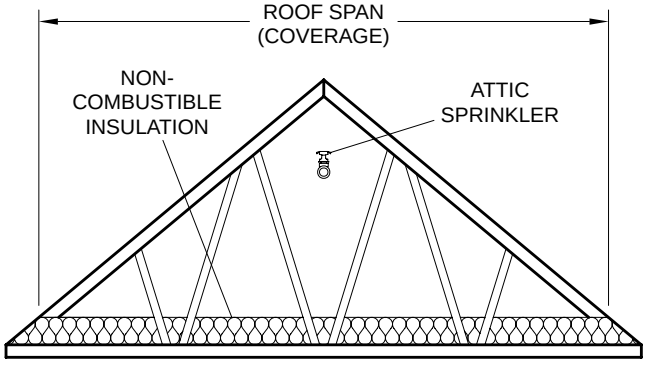


FIGURE 13
Roof Span (Coverage) Is Measured At Top Of Noncombustible Insulation

Attic Spaces Greater Than 40 Feet (12,2 m) Wide & Attic Spaces Greater Than 60 Feet (18,3 m) Up To 80 Feet (24,4 m) Wide,
(Ref. Figure 14 & 15)

Attic sprinklers in conjunction with standard sprinklers can be used to protect attics up to 80 feet (24,4 m) wide.

NOTE

Attics over 80 feet (24,4 m) wide must use standard sprinklers throughout because attic sprinklers have not been tested in this scenario.

For single ridge construction (Ref. Figure 14), use attic sprinklers to protect the center portion. Standard sprinklers are then used to protect up to 10 feet (3,1 m) of width at the eaves (beyond the allowable attic sprinkler roof span). The standard sprinkler on center spacing is a maximum of 7 feet (2,1 m) and a minimum of 6 feet (1,8 m).

For hip roof construction (Ref. Figure 15), use BB sprinklers in the center portion and HIP sprinklers can be located down the entire hip. Standard sprinklers are then used to protect up 10 feet (3,1 m) of width at the eaves (beyond the allowable attic sprinkler roof span). Starting at 31 feet (9,5 m) from the corner, the standard sprinkler on center spacing is a maximum spacing of 7 feet (2,1 m) and a minimum spacing of 6 feet (1,8 m).

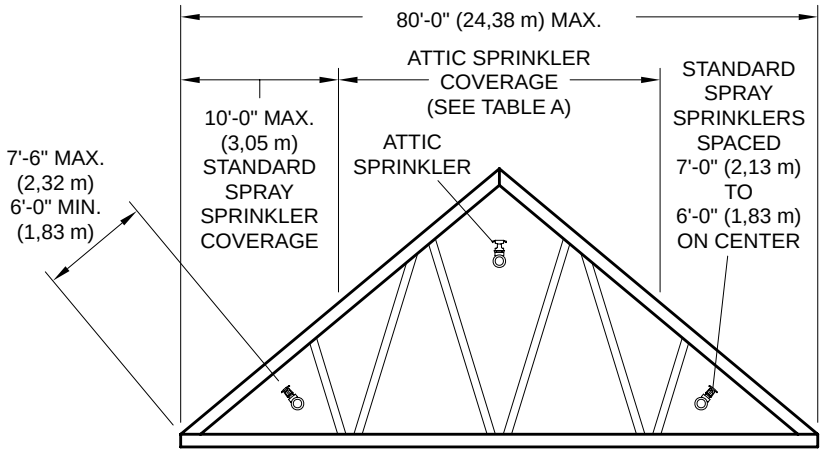


FIGURE 14

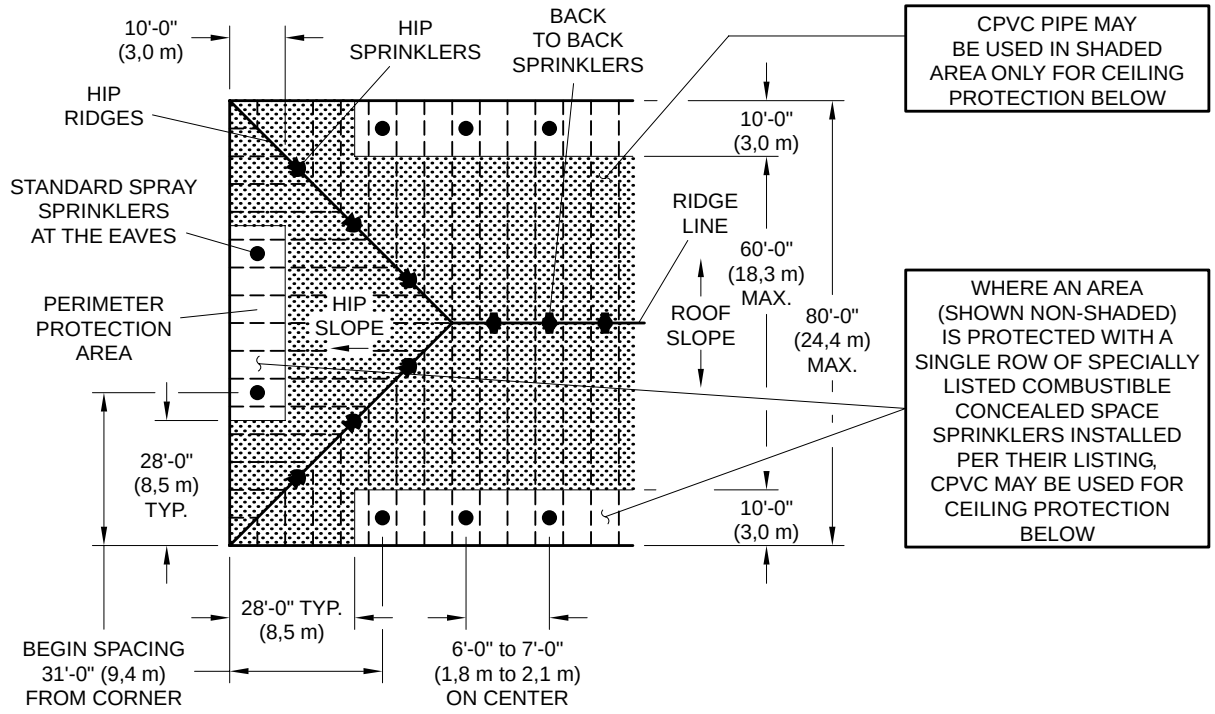


FIGURE 15

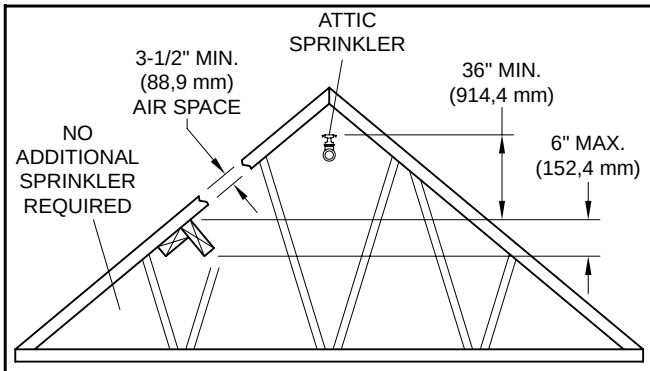


FIGURE 16A

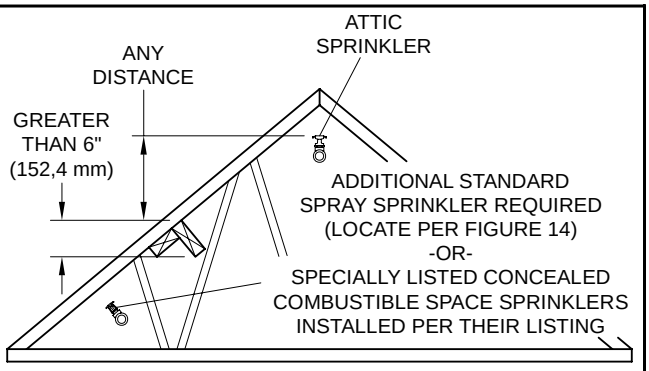


FIGURE 16B

There can be a maximum 6 inch (152,4 mm) high Horizontal Obstruction as long as it is 36 inches (914,4 mm), measured vertically, below the Attic Sprinkler. If the obstruction is closer or larger, there must be a sprinkler on the other side of the obstruction. Reference Figures 16A and 16B. This criteria does not limit the top chord of the trusses or the depth of the rafter, but does limit the obstructions that run across the trusses or rafters.

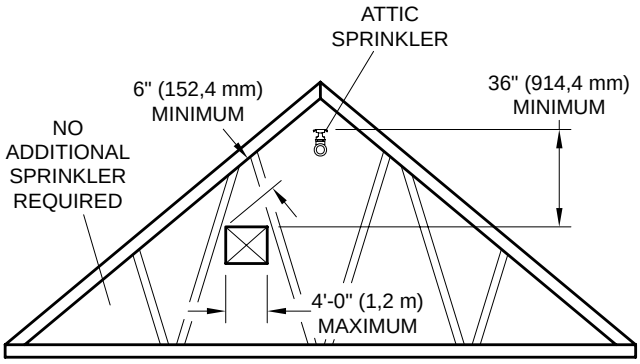


FIGURE 16C

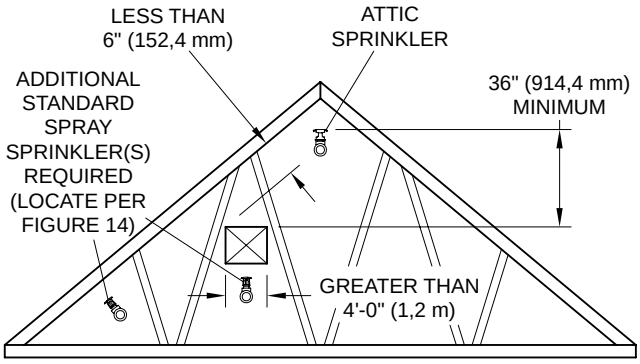


FIGURE 16D

If the Horizontal Obstruction is below the sprinkler, there must be 6 inches (152,4 mm) clearance over the top of the obstruction, and the obstruction must be 4 feet (1,2 m) or less in width to allow water to pass both over and under the obstruction. The clearance is measured perpendicular to and from the bottom of the rafter. If there is not 6 inches (152,4 mm) of clearance above the obstruction, a sprinkler must be located on the other side of the obstruction. If the obstruction is greater than 4 feet (1,2 m) in width, a sprinkler must be added below the obstruction. Reference Figures 16C and 16D. Standard sprinklers added below obstructions may be spaced a maximum of 15 feet (4,6 m) apart.

Dimension A	Distance B	Additional Sprinkler Required Beyond Obstruction
Maximum Horizontal Dimension of Obstruction	Minimum Horizontal Distance to Obstruction	
All Vertical Obstructions	< 6" (152,4 mm)	YES
1/2"-1" (12,7 mm-25,4 mm)	6" (152,4 mm)	NO
1"-4" (25,4 mm-101,6 mm)	12" (304,8 mm)	NO
4"-8" (101,4 mm-203,2 mm)	24" (609,6 mm)	NO
8"-10" (203,2 mm-254,0 mm)	5'-0" (1,52 m)	NO
10"-20" (254,0 mm-508,0 mm)	10'-0" (3,05 m)	NO
20"-30" (508,0 mm-762,0 mm)	15'-0" (4,57 m)	NO
30"-40" (762,0 mm-1016,0 mm)	20'-0" (6,10 m)	NO
40"-48" (1016,0 mm-1219,2 mm)	25'-0" (7,62 m)	NO
> 48" (1219,2 mm)	Any Distance	YES

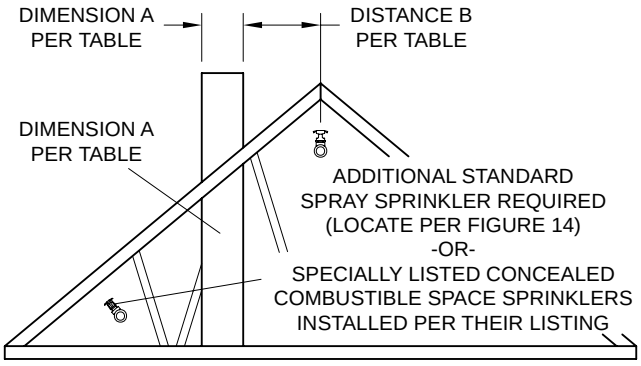


FIGURE 16E

For Vertical Obstructions, the maximum dimension of the obstruction is its width and the horizontal distance away from the obstruction is measured horizontally.

FIGURE 16 — PART 1 of 2 — OBSTRUCTIONS TO WATER DISTRIBUTION
(Obstructions to water distribution for Attic Sprinklers differ from standard sprinklers as shown)

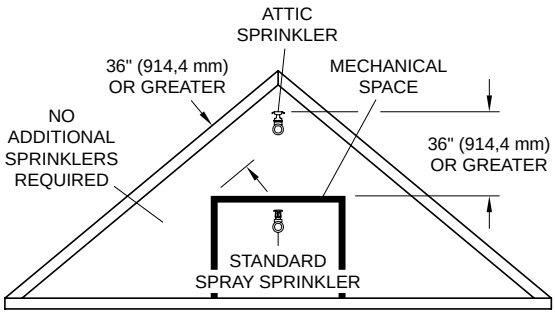
FIGURE 16F
Area Outside Of Mechanical Space
Or Similar Compartmented Space

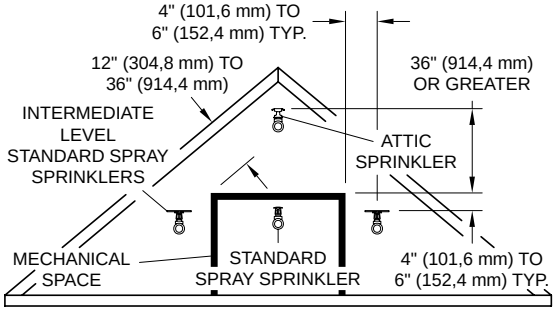
When the attic sprinkler is a 36 inches (914,4 mm) or greater above the space, and a 36 inches (914,4 mm) or greater clearance above the space is present, additional sprinklers are not needed.

When the attic sprinkler is a 36 inches (914,4 mm) or greater above the space, and a 12 to 36 inches (304,8 mm to 914,4 mm) clearance above the space is present, intermediate level standard sprinklers are to be installed to protect the obstructed area.

Otherwise, the area beyond the mechanical space is to be protected as shown by installing standard sprinklers as necessary — OR — by constructing a shear wall and installing SD Sprinklers.

NOTE: In all cases, the mechanical space or similar compartmented space is to be sprinklered per its respective hazard rating and separated from the light hazard attic space by construction that has a fire resistance rating based on the water supply duration required for the hazard rating within the mechanical space or similar compartmented space.





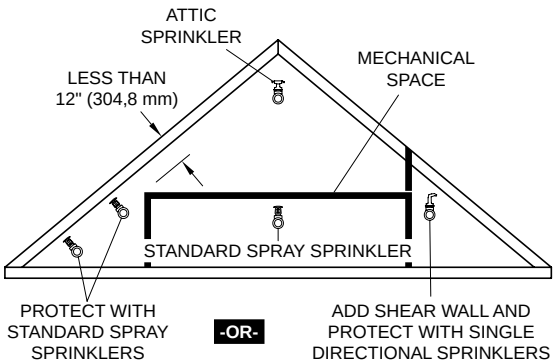
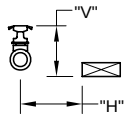


FIGURE 16G
Piggyback
Trusses

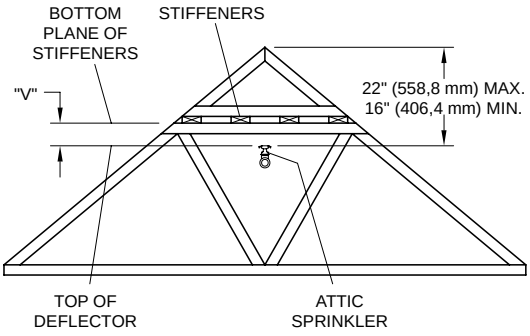
When the attic sprinkler can be installed below or between stiffeners and maintain the 16 to 22 inch (404,4 to 558,8 mm) distance to the peak, as well as the “V” and “H” clearance to the stiffeners, additional sprinklers are not required.

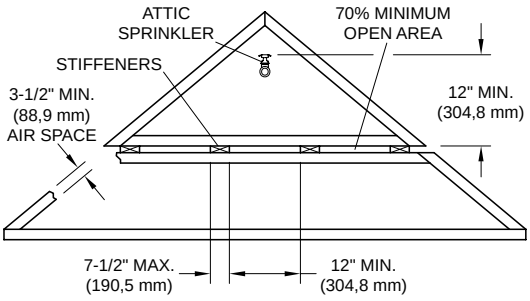
When the stiffeners are located a minimum of 12 inches (304,8 mm) below the attic sprinkler, the stiffeners are 7-1/2 inches (190,5 mm) maximum in width, the openings are 12 inches (304,8 mm) minimum, and there is 70% minimum open area, additional sprinklers are not required.

Otherwise, additional sprinklers are required as shown.



V	H		
	BB1	BB2	BB3
0"	0"	0"	0"
V > 0"	V + 15"	V + 10"	V + 8"





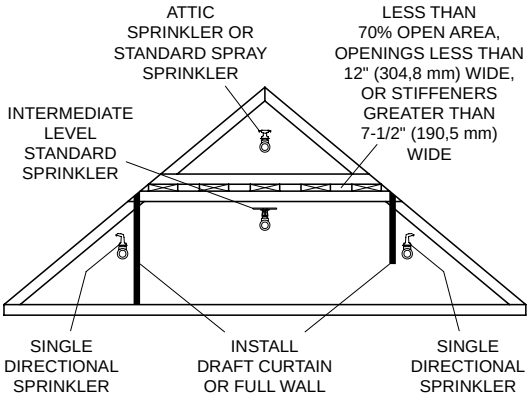


FIGURE 16 — PART 2 of 2 — OBSTRUCTIONS TO WATER DISTRIBUTION
(Obstructions to water distribution for Attic Sprinklers differ from standard sprinklers as shown)

HYDRAULIC CALCULATIONS

Attic sprinklers must be calculated in conformance with these guidelines. In all cases, the design area shall include the most hydraulically demanding sprinklers. More than one set of calculations may be required to prove different situations.

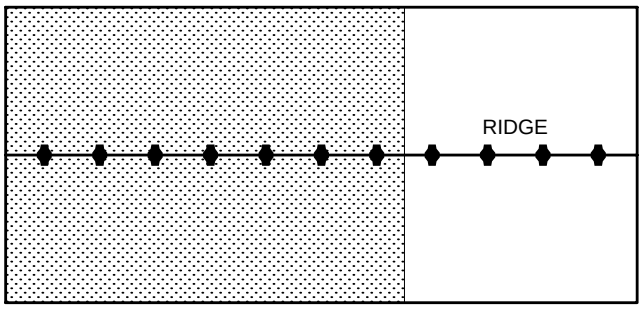
The hydraulic calculations have been divided into two parts: “Attics Protected Entirely By Specific Application Attic Sprinklers”, and “Attics Protected With A Mixture Of Specific Application Attic Sprinklers And Standard Sprinklers”.

The following symbols are used to designate attic and standard sprinklers:

PART A — “ATTICS PROTECTED ENTIRELY BY SPECIFIC APPLICATION ATTIC SPRINKLERS”

Part A-1. BB Sprinklers

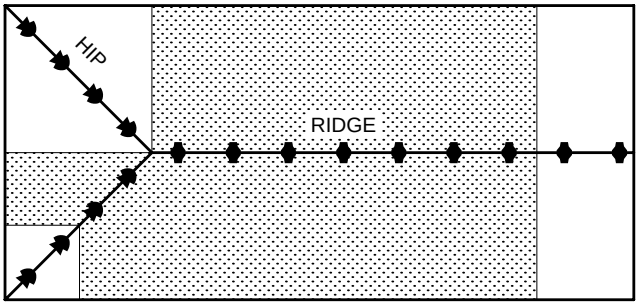
- Wet Systems — Calculate the most demanding five sprinklers.
- Dry Systems — Calculate the most demanding seven sprinklers (see adjacent figure).



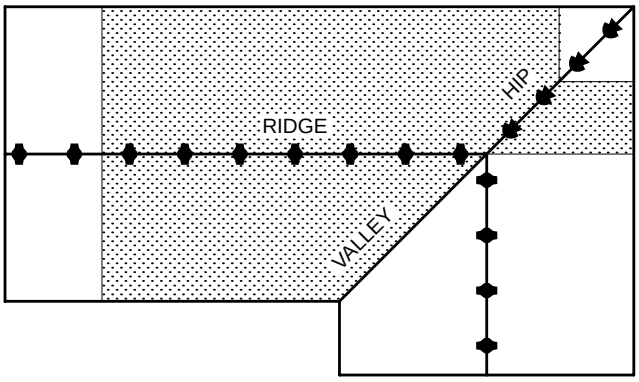
DRY SYSTEM SHOWN

Part A-2. BB and HIP Sprinklers

- Wet Systems — Calculate the most demanding five sprinklers.
- Dry Systems — Calculate the most demanding seven sprinklers, and then calculate the most demanding contiguous nine sprinklers with a maximum of seven to be BB Sprinklers (see adjacent figures). Use the most demanding calculation.



DRY SYSTEM SHOWN

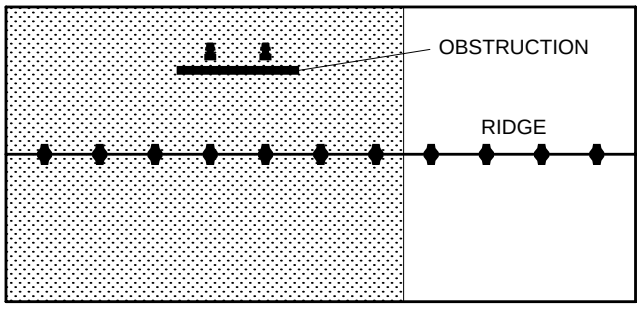


DRY SYSTEM SHOWN

FIGURE 17 — PART 1 of 5 — HYDRAULIC CALCULATIONS

Part A-3. BB and SD Sprinklers

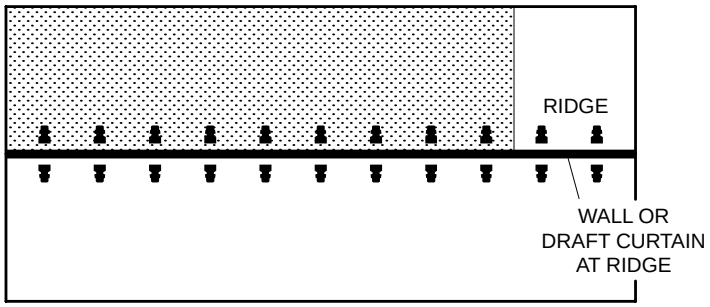
- Wet Systems — Calculate the most demanding five BB Sprinklers plus two SD Sprinklers.
- Dry Systems — Calculate the most demanding seven BB Sprinklers plus up to two SD Sprinklers (see adjacent figure).



DRY SYSTEM SHOWN

Part A-4. SD Sprinklers

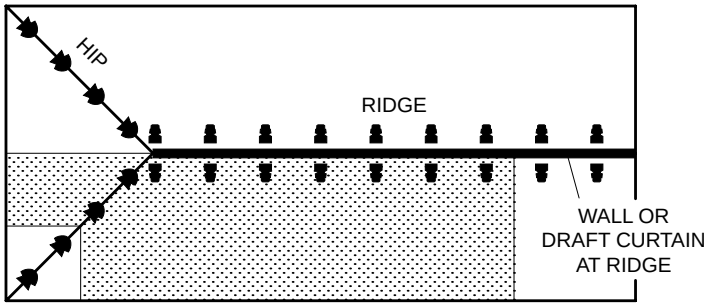
- Wet Systems — Calculate the most demanding five SD Sprinklers.
- Dry Systems — Calculate the most demanding nine SD Sprinklers (see adjacent figure).



DRY SYSTEM SHOWN

Part A-5. SD and HIP Sprinklers

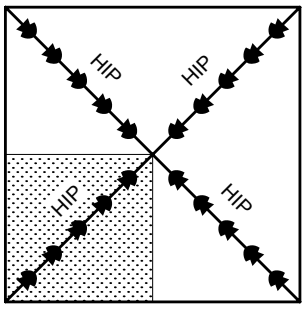
- Wet Systems — Calculate the most demanding five sprinklers.
- Dry Systems — Calculate the most demanding nine sprinklers with a maximum of seven to be SD Sprinklers (see adjacent figure).



DRY SYSTEM SHOWN

Part A-6. HIP Sprinklers

- Wet Systems — Calculate the most demanding five sprinklers (see adjacent figure).
- Dry Systems — Calculate the most demanding nine sprinklers.



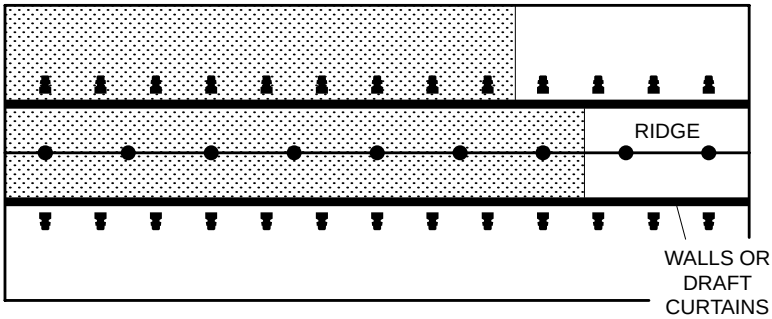
WET SYSTEM SHOWN

FIGURE 17 — PART 2 of 5 — HYDRAULIC CALCULATIONS

PART B — "ATTICS PROTECTED WITH A MIXTURE OF SPECIFIC APPLICATION ATTIC SPRINKLERS AND STANDARD SPRINKLERS"

Part B-1. SD Sprinklers & Standard Sprinklers At The Ridge

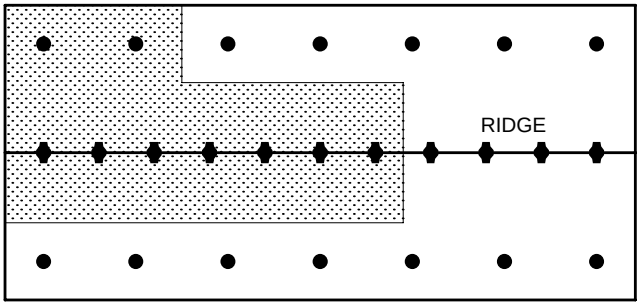
- Wet Systems — Calculate the most demanding five sprinklers of one type. Use the most demanding calculation.
- Dry Systems — Calculate the most demanding nine SD Sprinklers, and then calculate the most demanding seven Standard Sprinklers. Use the most demanding calculation (see adjacent figure).



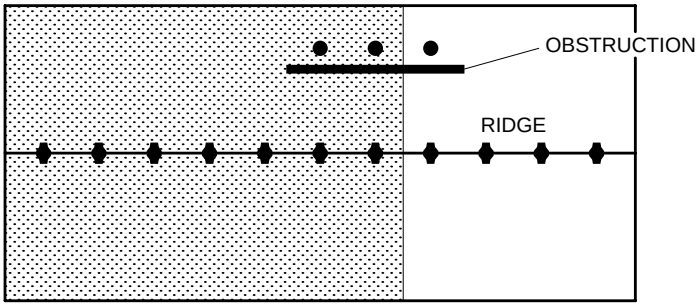
DRY SYSTEM SHOWN

Part B-2. BB Sprinklers & Standard Sprinklers At The Eaves or Beyond An Obstruction

- Wet Systems — Calculate the most demanding five BB Sprinklers plus up to two most demanding Standard Sprinklers.
- Dry Systems — Calculate the most demanding seven BB Sprinklers plus up to two most demanding Standard Sprinklers (see adjacent figures).



DRY SYSTEM SHOWN



DRY SYSTEM SHOWN

FIGURE 17 — PART 3 of 5 — HYDRAULIC CALCULATIONS

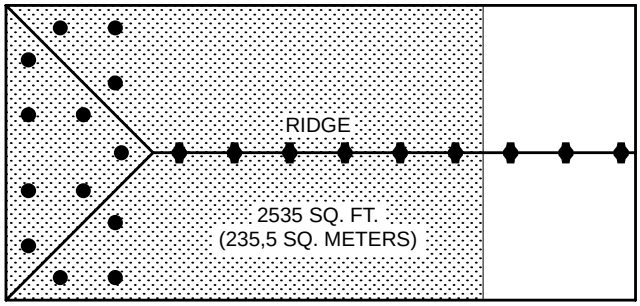
Part B-3. BB Sprinklers & Standard Sprinklers At The Hip

Where the total number of Standard Sprinklers at the hip is four or less:

- Wet Systems — Calculate the most demanding five BB Sprinklers plus up to two most demanding Standard Sprinklers.
- Dry Systems — Calculate the most demanding seven BB Sprinklers plus up to two most demanding Standard Sprinklers.

Where the total number of standard sprinklers at the hip is greater than four:

- Wet Systems — Calculate design area per NFPA 13 (i.e., area reduction for quick response & 30% increase for sloped ceilings). Include all sprinklers types within this area.
- Dry Systems — Calculate design area per NFPA 13 (i.e., 30% increase for sloped ceilings & 30% increase for dry systems). Include all sprinklers types within this area (see adjacent figure).



DRY SYSTEM SHOWN

NOTE:
Wet Pipe = 1500 ft^2 (NFPA Light Hazard) x 1.3 = 1950 ft^2
Dry Pipe = 1500 ft^2 (NFPA Light Hazard) x 1.3 x 1.3 = 2535 ft^2

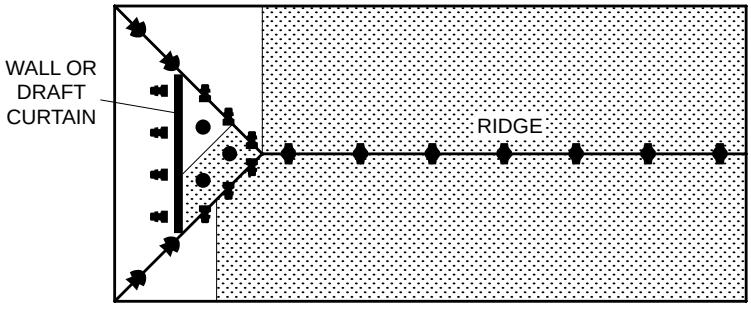
Part B-4. BB Sprinklers, SD Sprinklers, HIP Sprinklers, & Standard Sprinklers At The Hip

Where the total number of Standard Sprinklers at the hip is four or less:

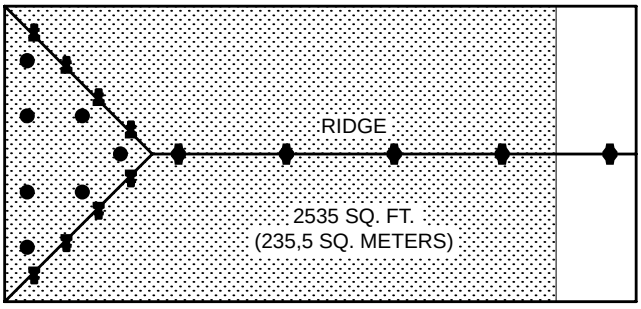
- Wet Systems — Calculate the most demanding five Attic Sprinklers plus up to two most demanding Standard Sprinklers.
- Dry Systems — Calculate the most demanding nine Attic Sprinklers plus up to two most demanding Standard Sprinklers (Of the nine Attic Sprinklers, calculate up to a maximum of seven BB Sprinklers, see adjacent upper figure).

Where the total number of standard sprinklers at the hip is greater than four:

- Wet Systems — Calculate design area per NFPA 13 (i.e., area reduction for quick response & 30% increase for sloped ceilings). Include all sprinklers types within this area.
- Dry Systems — Calculate design area per NFPA 13 (i.e., 30% increase for sloped ceilings & 30% increase for dry systems). Include all sprinklers types within this area (see adjacent lower figure).



DRY SYSTEM SHOWN



DRY SYSTEM SHOWN

NOTE:
Wet Pipe = 1500 ft^2 (NFPA Light Hazard) x 1.3 = 1950 ft^2
Dry Pipe = 1500 ft^2 (NFPA Light Hazard) x 1.3 x 1.3 = 2535 ft^2

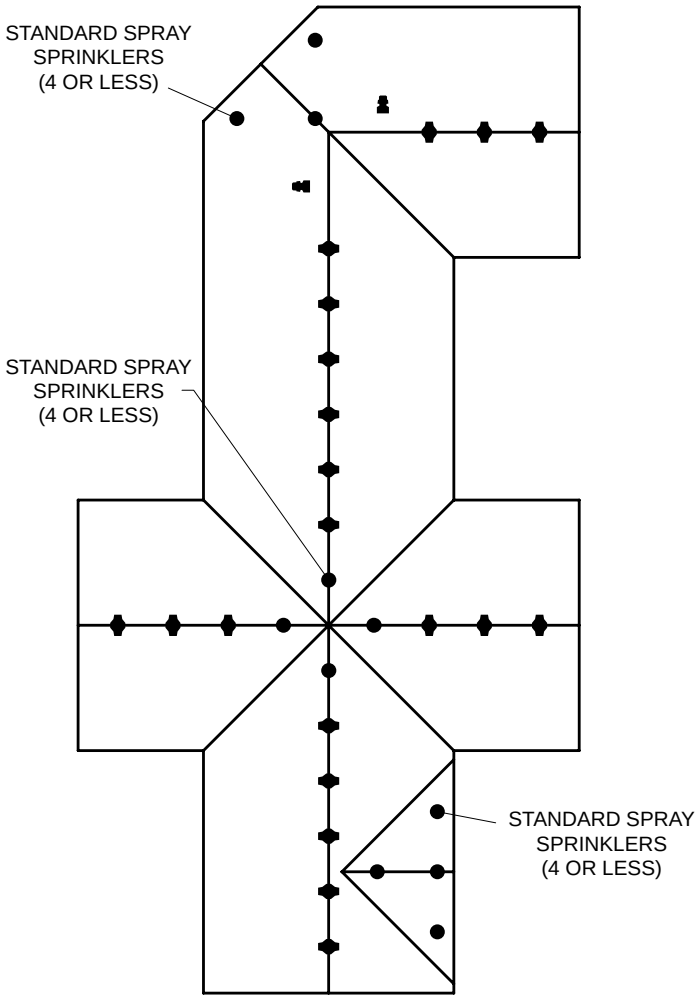
FIGURE 17 — PART 4 of 5 — HYDRAULIC CALCULATIONS

Part B-5. Attic Sprinklers & Standard Sprinklers in a Dormer, at a Cross, or at an Ell

Where the quantity of standard sprinklers in each dormer, cross, or ell is four or less (see adjacent figure) and all of the dormers, crosses and ells meet the maximum four standard sprinkler criteria, calculate the Attic Sprinkler demand as described in Part A-1 thru A-6 or Part B-1 thru B-4, plus up to two of the most demanding standard sprinklers in the dormer, cross, or ell that is adjacent to the Attic Sprinklers that are being included in the demand calculation.

Where the quantity of standard sprinklers in any dormer, cross, or ell is greater than four:

- Wet Systems — Calculate design area per NFPA 13 (i.e., area reduction for quick response & 30% increase for sloped ceilings). Include all sprinklers types within this area.
- Dry Systems — Calculate design area per NFPA 13 (i.e., 30% increase for sloped ceilings & 30% increase for dry systems). Include all sprinklers types within this area.



Part B-6. Attic Sprinklers & Standard Sprinklers Separated By Compartmentalization

Calculate the Attic Sprinkler demand as described in Part A-1 thru A-6 or Part B-1 thru B-4, and then calculate the Standard Sprinklers per NFPA 13. Use the most demanding calculation (see adjacent figure).

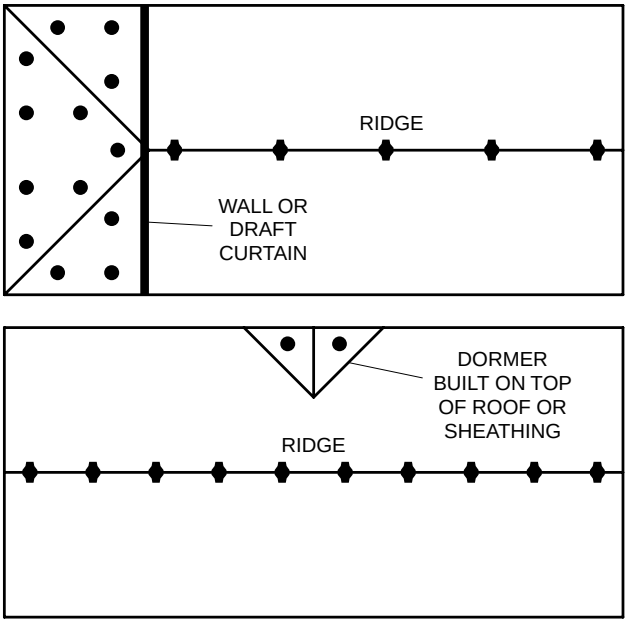


FIGURE 17 — PART 5 of 5 — HYDRAULIC CALCULATIONS

Care and Maintenance

The Specific Application Attic Sprinklers must be maintained and serviced in accordance with the following instructions:

NOTE

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, permission to shut down the affected fire protection systems must be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

Sprinklers that are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced.

Over-heated solder type sprinklers must be replaced. Bulb-type sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section).

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. The installing contractor or sprinkler manufacturer should be contacted relative to any questions.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

Limited Warranty

Products manufactured by Tyco Fire & Building Products are warranted solely to the original Buyer for ten (10) years against defects in material and workmanship when paid for and properly installed and maintained under normal use and service. This warranty will expire ten (10) years from date of shipment by Tyco Fire & Building Products. No warranty is given for products or components manufactured by companies not affiliated by ownership with Tyco Fire & Building Products or for products and components which have been subject to misuse, improper installation, corrosion, or which have not been installed, maintained, modified or repaired in accordance with applicable Standards of the National Fire Protection Association, and/or the standards of any other Authorities Having Jurisdiction. Materials found by Tyco Fire & Building Products to be defective shall be either repaired or replaced, at Tyco Fire & Building Products' sole option. Tyco Fire & Building Products neither assumes, nor authorizes any person to assume for it, any other obligation in connection with the sale of products or parts of products. Tyco Fire & Building Products shall not be responsible for sprinkler system design errors or inaccurate or incomplete information supplied by Buyer or Buyer's representatives.

IN NO EVENT SHALL TYCO FIRE & BUILDING PRODUCTS BE LIABLE, IN CONTRACT, TORT, STRICT LIABILITY OR UNDER ANY OTHER LEGAL THEORY, FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LABOR CHARGES, REGARDLESS OF WHETHER TYCO FIRE & BUILDING PRODUCTS WAS INFORMED ABOUT THE POSSIBILITY OF SUCH DAMAGES, AND IN NO EVENT SHALL TYCO FIRE & BUILDING PRODUCTS' LIABILITY EXCEED AN AMOUNT EQUAL TO THE SALES PRICE.

THE FOREGOING WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Ordering Procedure

Contact your local distributor for availability.

Sprinkler Assemblies with NPT Thread Connections:
Specify: Model (specify), K-factor (specify), SIN (specify), Specific Application Attic Sprinkler, P/N (specify).

BB1 (K=8.0),
TY4180 . . . . . P/N 51-623-1-200
BB2 (K=8.0),
TY4181 . . . . . P/N 51-621-1-200
BB3 (K=8.0),
TY4182 . . . . . P/N 51-622-1-200

BB1 (K=5.6),
TY3180 . . . . . P/N 50-601-1-212
BB2 (K=5.6),
TY3181 . . . . . P/N 50-602-1-212
BB3 (K=5.6),
TY3182 . . . . . P/N 50-603-1-212

SD1 (K=5.6),
TY3183 . . . . . P/N 50-611-1-212
SD2 (K=5.6),
TY3184 . . . . . P/N 50-612-1-212
SD3 (K=5.6),
TY3185 . . . . . P/N 50-613-1-212

HIP (K=5.6),
TY3187 . . . . . P/N 51-620-1-200

Sprinkler Wrench:
Specify: W-Type 3 Sprinkler Wrench, P/N 56-895-1-001.

Specify: W-Type 20 Sprinkler Wrench, P/N 56-000-1-106.