bic design co.
FIRE PROTECTION SPECIALISTS

130 W 9th Ave, Suite 102
North Kansas City, MO 64116
816.221.0551
bicdesign@bicdesign.net

HYDRAULIC DESIGN COVER SHEET

ORIGINAL DATE: **06/04/2021**
REVISION DATE:

CALCULATED BY: **Jeff Keltner**

JOB INFORMATION	
JOB NAME: **The Princeton**	
ADDRESS: **1701 SE Oldham Parkway**	CITY, STATE: **Lee's Summit, MO**
BUILDING INFO:	CONSTRUCTION: **Combustible, Unobstructed**
CONTRACTOR: **Aegis Fire Protection, LLC**	CONTRACT #: **13553**

AREA SUMMARY	
AREA NO: **19**	DESCRIPTION: **Canopy Attic**
AREA NO: **20**	DESCRIPTION: **Canopy Ceiling**
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	DESCRIPTION:
AREA NO:	

WATER SUPPLY INFORMATION	
FLOW TEST? **Yes**	PUMP? **No**
DATE: **02/22/2019**	RATED CAPACITY (GPM):
STATIC PRESSURE (PSI): **76**	RATED PRESSURE (PSI):
RESIDUAL PRESSURE (PSI): **47**	ELEVATION:
FLOW (GPM): **1600**	PUMP MOTOR TYPE:
ELEVATION: **Same as Fin Flr**	TANK? **No**
LOCATION: **1716 SE 11th St.**	CAPACITY (GALLONS):
SOURCE: **Provided by Aegis Fire Protection**	ELEVATION:

NOTES:

PE STAMP

Hydrant Flow Test WORKORDER

WorkOrder #: **91453**
Supervisor: **DOLAN, EVAN**
Submit To: **JOHNSON, JD**
WO Address: **1716 SE 11TH ST, 1716 SE 11TH ST**
Start Date: **2/22/2019 12:00:00 PM**
Priority: **Low**
Initiated By: **JOHNSON, JD**
WO Map Page: **068**

Associated Service Requests

SR #	SR Description	Date Initiated	Problem Address	Details

Additional Information	
PRESSURE STATIC (PSI)	76
PRESSURE RESIDUAL (PSI)	47
GPM	1600

Crew Lead: _____ Estimated Labor Hours: _____

Employee	*Start Date*	*Start Time*	*Finish Date*	*Finish Time*	*Hours*	*Rate Type*	*Valid Rate Types*
							A = Hourly
							B = Overtime
							C = Holiday/Emerg
							D = Fixed Rate

PW Restoration?

Location	Pavement Sq. Ft.	Curb LF	Driveway Sq. Ft.	Sidewalk Sq. Ft.	Yard Sq. Ft.
Front / Rear / Side	Asphalt_____ Concrete_____		Asphalt_____ Concrete_____		

Material used (Please list all dimensions):
_____
_____

Vehicle 1: _____ Hours: _____ **Vehicle 2: _____ Hours**: _____ **Vehicle 3: _____ Hours**: _____
Vehicle 4: _____ Hours: _____ **Vehicle 5: _____ Hours**: _____ **Vehicle 6: _____ Hours**: _____
Other: (explain in detail)_____

Other Tools & Consumables_____
_____
_____

Instructions: Perform flow test for water engineering on FH 068-070.

Comments:
By JOHNSON, JD : 2/26/2019 9:08:30 AM
Tested 2-26-19
_____
_____
_____

WPressurizedMain Information:

WHYDRANT	
OBJECTID	2390
AdministrativeArea	LEES SUMMIT
FacilityID	068-070 FH
Location	1716 SE 11TH ST
InstallDate	1/1/1995 12:00:00 AM
LifeCycleStatus	ACTIVE
WarrantyDate	
Manufacturer	WATEROUS
Model	PACER
PaintCondition	GOOD
HydOwner	PUBLIC
DETAILS	

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HYDRAULIC DESIGN COVER SHEET

AREA: **19 – Canopy Attic**
CALCULATED BY: **Jeff Keltner**

ORIGINAL DATE: **06/04/2021**
LATEST REVISION DATE:

JOB INFORMATION	
JOB NAME: **The Princeton**	
ADDRESS: **1701 SE Oldham Parkway**	CITY, STATE: **Lee's Summit, MO**
BUILDING INFO:	CONSTRUCTION: **Combustible, Obstructed**
CONTRACTOR: **Aegis Fire Protection, LLC**	CONTRACT #: **13553**

WATER SUPPLY INFORMATION	
FLOW TEST? **See Front Cover Page**	PUMP? **No**
DATE:	RATED CAPACITY (GPM):
STATIC PRESSURE (PSI):	RATED PRESSURE (PSI):
RESIDUAL PRESSURE (PSI):	ELEVATION:
FLOW (GPM):	PUMP MOTOR TYPE:
ELEVATION:	TANK? **No**
LOCATION:	CAPACITY (GALLONS):
SOURCE:	ELEVATION:

OPERATING AREA INFORMATION		
AREA #: **19**	SYSTEM TYPE: **Dry**	SHEET NUMBER: **2 of 14**
CEILING HEIGHT: **Varies**	STORAGE HEIGHT: **N/A**	QR SPRINKLER DISCOUNT: **No**

SPRINKLER INFORMATION	
BRAND: **Viking**	MODEL: **V-BB**
K-FACTOR: **5.6**	TEMPERATURE (°F): **200**

SYSTEM DESIGN INFORMATION	
DESIGN PER: **NFPA 13, 2013**	HAZARD CLASSIFICATION: **Light Hazard**
DESIGN CRITERIA: **(SEE ATTACHED SPRINKLER LITERATURE)**	
DENSITY (GPM/SQ FT):	OPERATING AREA (SQ FT): **7 Back to Back**
AREA PER SPRINKLER (SQ FT):	TOTAL SPRINKLERS OPERATING: **7**
MIN. FLOW PER HEAD (GPM): **N/A**	MIN. PRESSURE PER HEAD (PSI): **N/A**
INSIDE HOSE ALLOWANCE (GPM): **0**	OUTSIDE HOSE ALLOWANCE (GPM): **100**
OVERHEAD PIPING C-FACTOR: **100/120**	UNDERGROUND PIPING C-FACTOR: **140**

CALCULATION SUMMARY		
DEMAND @: **Base of Riser**	FLOW REQ'D (GPM): **268.52**	PRESSURE REQ'D (PSI): **38.325**
DEMAND @: **Conn to City Main**	FLOW REQ'D (GPM): **268.52**	PRESSURE REQ'D (PSI): **42.860**
AREA SAFETY MARGIN (PSI): **32.073**		

NOTES:	PE STAMP

Water Supply Curve C

BIC Design Company
The Princeton Area #19 - 7 Back to Back Heads

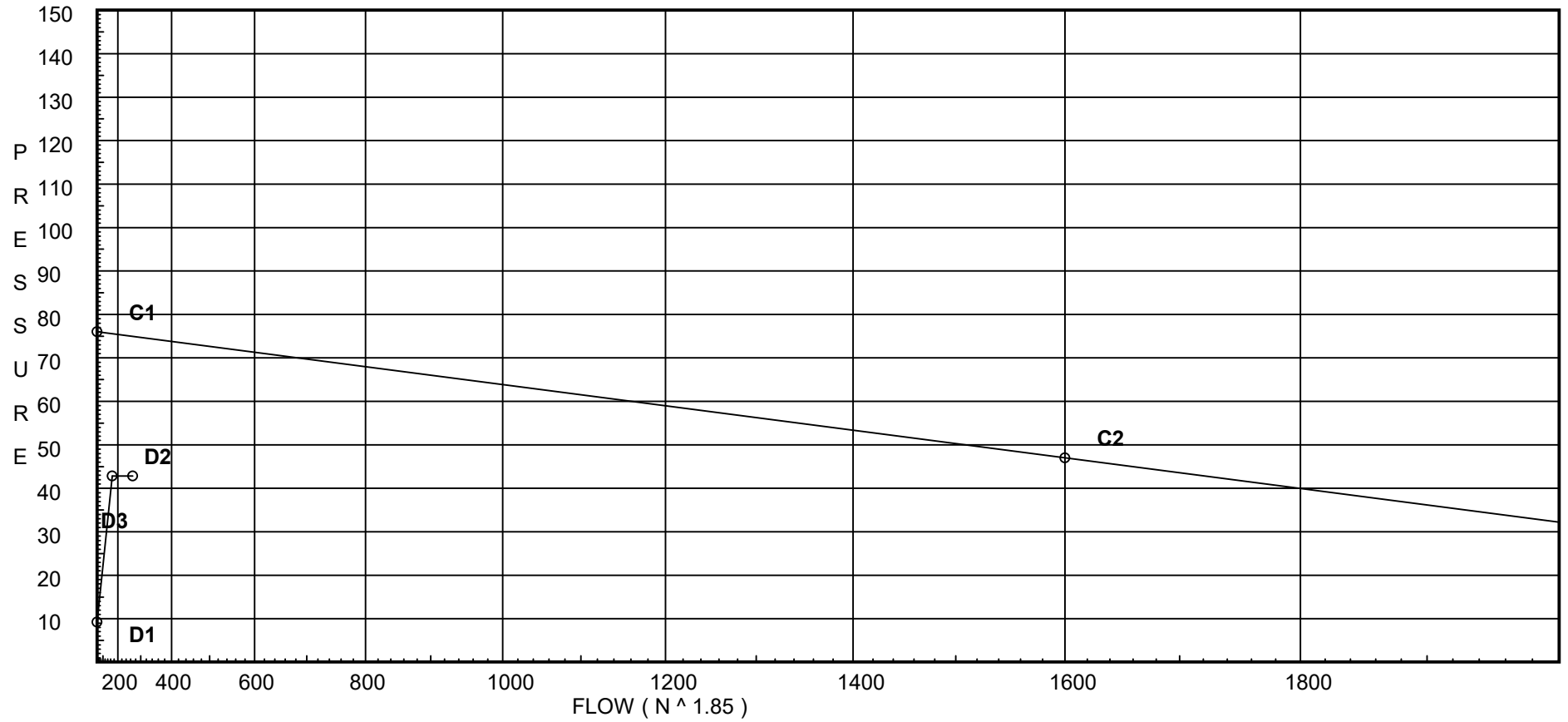
Date

City Water Supply:

C1 - Static Pressure	**: 76**
C2 - Residual Pressure:	**47**
C2 - Residual Flow	**: 1600**

Demand:

D1 - Elevation	**: 9.238**
D2 - System Flow	**: 168.516**
D2 - System Pressure	**: 42.860**
Hose (Demand)	**: 100**
D3 - System Demand	**: 268.516**
Safety Margin	**: 32.073**



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50							
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zwe	Watts 757 Horiz	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Pressure / Flow Summary - STANDARD

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP01	16.0	5.6	12.13	na	19.5	0.15	130	7.0
EQ01	16.92		12.15	na				
C01	21.33	5.6	18.37	na	24.0	0.1	240	7.0
C02	21.33	5.6	18.37	na	24.0	0.1	240	7.0
C03	21.33	5.6	18.39	na	24.02	0.1	240	7.0
C04	21.33	5.6	18.43	na	24.04	0.1	240	7.0
C05	21.33	5.6	18.5	na	24.09	0.1	240	7.0
C06	21.33	5.6	18.57	na	24.13	0.1	240	7.0
C07	21.33	5.6	18.72	na	24.23	0.1	240	7.0
701	16.92		23.07	na				
702	16.92		23.07	na				
703	16.92		23.07	na				
704	16.92		23.09	na				
705	16.92		23.09	na				
706	16.92		23.14	na				
707	16.92		23.15	na				
708	16.92		23.22	na				
709	16.92		23.26	na				
710	16.92		23.3	na				
711	16.92		23.47	na				
712	16.92		23.48	na				
713	16.92		23.77	na				
714	16.92		24.07	na				
715	16.92		24.38	na				
716	16.92		24.7	na				
717	13.04		27.46	na				
718	8.125		32.83	na				
719	5.0		35.81	na				
HDR	5.0		36.02	na	100.0			
BOR	1.0		38.32	na				
UG1	0.0		39.4	na				
UG2	0.0		39.51	na				
UG3	0.0		39.49	na				
UG4	0.0		39.47	na				
UG5	0.0		39.46	na				
BFP	0.0		39.72	na				
TEST	0.0		42.86	na				

The maximum velocity is 8.99 and it occurs in the pipe between nodes C07 and 711

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
DP01	19.50	1.049	E	1.427	1.000	12.125		K Factor = 5.60
to		100.0		0.0	1.427	-0.398		
EQ01	19.5	0.1739		0.0	2.427	0.422		Vel = 7.24
	0.0							
	19.50					12.149		K Factor = 5.59
C01	24.00	1.049	E	1.427	5.920	18.367		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
701	24.0	0.2555		0.0	10.915	2.789		Vel = 8.91
	0.0							
	24.00					23.066		K Factor = 5.00
C02	24.00	1.049	E	1.427	5.920	18.373		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
703	24.0	0.2555		0.0	10.915	2.789		Vel = 8.91
	0.0							
	24.00					23.072		K Factor = 5.00
C03	24.02	1.049	E	1.427	5.920	18.392		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
705	24.02	0.2558		0.0	10.915	2.792		Vel = 8.92
	0.0							
	24.02					23.094		K Factor = 5.00
C04	24.04	1.049	E	1.427	5.920	18.433		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
706	24.04	0.2563		0.0	10.915	2.798		Vel = 8.92
	0.0							
	24.04					23.141		K Factor = 5.00
C05	24.09	1.049	E	1.427	5.920	18.503		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
708	24.09	0.2573		0.0	10.915	2.808		Vel = 8.94
	0.0							
	24.09					23.221		K Factor = 5.00
C06	24.13	1.049	E	1.427	5.920	18.574		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
710	24.13	0.2581		0.0	10.915	2.817		Vel = 8.96
	0.0							
	24.13					23.301		K Factor = 5.00
C07	24.23	1.049	E	1.427	5.920	18.722		K Factor = 5.60
to		100.0	T	3.568	4.995	1.910		
711	24.23	0.2600		0.0	10.915	2.838		Vel = 8.99
	0.0							
	24.23					23.470		K Factor = 5.00
701	24.00	3.26		0.0	1.880	23.066		
to		100.0		0.0	0.0	0.0		
702	24.0	0.0011		0.0	1.880	0.002		Vel = 0.92
702	0.0	3.26		0.0	4.120	23.068		
to		100.0		0.0	0.0	0.0		
703	24.0	0.0010		0.0	4.120	0.004		Vel = 0.92
703	24.00	3.26		0.0	4.040	23.072		
to		100.0		0.0	0.0	0.0		
704	48.0	0.0037		0.0	4.040	0.015		Vel = 1.84

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*******	Notes	******
704	0.0	3.26		0.0	2.000	23.087				
to		100.0		0.0	0.0	0.0				
705	48.0	0.0035		0.0	2.000	0.007		Vel = 1.84		
705	24.02	3.26		0.0	6.000	23.094				
to		100.0		0.0	0.0	0.0				
706	72.02	0.0078		0.0	6.000	0.047		Vel = 2.77		
706	24.04	3.26		0.0	0.330	23.141				
to		100.0		0.0	0.0	0.0				
707	96.06	0.0121		0.0	0.330	0.004		Vel = 3.69		
707	0.0	3.26		0.0	5.670	23.145				
to		100.0		0.0	0.0	0.0				
708	96.06	0.0134		0.0	5.670	0.076		Vel = 3.69		
708	24.09	3.26		0.0	2.000	23.221				
to		100.0		0.0	0.0	0.0				
709	120.15	0.0200		0.0	2.000	0.040		Vel = 4.62		
709	0.0	3.26		0.0	2.000	23.261				
to		100.0		0.0	0.0	0.0				
710	120.15	0.0200		0.0	2.000	0.040		Vel = 4.62		
710	24.14	3.26		0.0	6.000	23.301				
to		100.0		0.0	0.0	0.0				
711	144.29	0.0282		0.0	6.000	0.169		Vel = 5.55		
711	24.23	3.26		0.0	0.330	23.470				
to		100.0		0.0	0.0	0.0				
712	168.52	0.0394		0.0	0.330	0.013		Vel = 6.48		
712	0.0	3.26		0.0	7.670	23.483				
to		100.0		0.0	0.0	0.0				
713	168.52	0.0375		0.0	7.670	0.288		Vel = 6.48		
713	0.0	3.26		0.0	8.000	23.771				
to		100.0		0.0	0.0	0.0				
714	168.52	0.0376		0.0	8.000	0.301		Vel = 6.48		
714	0.0	3.26		0.0	8.330	24.072				
to		100.0		0.0	0.0	0.0				
715	168.52	0.0376		0.0	8.330	0.313		Vel = 6.48		
715	0.0	3.26	E	6.714	1.667	24.385				
to		100.0		0.0	6.714	0.0				
716	168.52	0.0376		0.0	8.381	0.315		Vel = 6.48		
716	0.0	3.26	2E	13.428	15.320	24.700				
to		100.0		0.0	13.429	1.680				
717	168.52	0.0376		0.0	28.749	1.081		Vel = 6.48		
717	0.0	3.26	6E	40.285	45.860	27.461				
to		100.0		0.0	40.285	2.129				
718	168.52	0.0376		0.0	86.145	3.238		Vel = 6.48		
718	0.0	3.26	Dvc	16.306	3.125	32.828				
to		100.0	B	9.592	40.285	1.353				
719	168.52	0.0376	T	14.388	43.410	1.632		Vel = 6.48		
719	0.0	4.26	T	26.334	2.500	35.813				
to		120.0		0.0	26.334	0.0				
HDR	168.52	0.0073		0.0	28.834	0.210		Vel = 3.79		

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
HDR	100.00	4.26	S	28.968	4.000	36.023		Qa = 100
to		120.0		0.0	28.968	1.732		
BOR	268.52	0.0173		0.0	32.968	0.570		Vel = 6.04
BOR	0.0	6.16	2E	40.168	190.000	38.325		
to		140.0	2F	20.084	107.593	0.433		
UG1	268.52	0.0022	T	43.037	297.593	0.640		Vel = 2.89
			G	4.304				
	0.0							
	268.52					39.398		K Factor = 42.78
UG1	234.24	6.16		0.0	65.000	39.398		
to		140.0		0.0	0.0	0.0		
UG2	234.24	0.0017		0.0	65.000	0.109		Vel = 2.52
UG2	-268.52	6.16	2T	86.075	200.000	39.507		
to		140.0		0.0	86.075	0.0		
UG3	-34.28	0.0		0.0	286.075	-0.013		Vel = 0.37
UG3	0.0	6.16	5F	50.21	490.000	39.494		
to		140.0		0.0	50.210	0.0		
UG4	-34.28	0.0		0.0	540.210	-0.026		Vel = 0.37
UG4	0.0	6.16	T	43.037	165.000	39.468		
to		140.0		0.0	43.037	0.0		
UG5	-34.28	0.0		0.0	208.037	-0.010		Vel = 0.37
UG5	0.0	6.16	4F	40.168	1160.000	39.458		
to		140.0	2E	40.168	80.336	0.0		
UG1	-34.28	0.0		0.0	1240.336	-0.060		Vel = 0.37
	0.0							
	-34.28					39.398		K Factor = -5.46
UG2	268.52	6.16	2E	40.168	60.000	39.507		
to		140.0		0.0	40.168	0.0		
BFP	268.52	0.0022		0.0	100.168	0.216		Vel = 2.89
BFP	0.0	6.16	2E	40.168	60.000	39.723		
to		140.0	Zwe	0.0	87.509	2.819		* * Fixed Loss = 2.819
TEST	268.52	0.0022	T	43.037	147.509	0.318		Vel = 2.89
			G	4.304				
	0.0							
	268.52					42.860		K Factor = 41.02

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FIRE PROTECTION SPECIALISTS

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HYDRAULIC DESIGN COVER SHEET

AREA: **20 – Canopy Ceiling**
CALCULATED BY: **Jeff Keltner**

ORIGINAL DATE: **06/04/2021**
LATEST REVISION DATE:

JOB INFORMATION	
JOB NAME: **The Princeton**	
ADDRESS: **1701 SE Oldham Parkway**	CITY, STATE: **Lee's Summit, MO**
BUILDING INFO:	CONSTRUCTION: **Combustible, Obstructed**
CONTRACTOR: **Aegis Fire Protection, LLC**	CONTRACT #: **13553**

WATER SUPPLY INFORMATION	
FLOW TEST? **See Front Cover Page**	PUMP? **No**
DATE:	RATED CAPACITY (GPM):
STATIC PRESSURE (PSI):	RATED PRESSURE (PSI):
RESIDUAL PRESSURE (PSI):	ELEVATION:
FLOW (GPM):	PUMP MOTOR TYPE:
ELEVATION:	TANK? **No**
LOCATION:	CAPACITY (GALLONS):
SOURCE:	ELEVATION:

OPERATING AREA INFORMATION		
AREA #: **20**	SYSTEM TYPE: **Dry**	SHEET NUMBER: **2 of 14**
CEILING HEIGHT: **Varies**	STORAGE HEIGHT: **N/A**	QR SPRINKLER DISCOUNT: **No**

SPRINKLER INFORMATION	
BRAND: **Victaulic**	MODEL: **V3506**
K-FACTOR: **5.6**	TEMPERATURE (°F): **200**

SYSTEM DESIGN INFORMATION	
DESIGN PER: **NFPA 13, 2013**	HAZARD CLASSIFICATION: **Ordinary Hazard Group 1**
DESIGN CRITERIA: **(SEE ATTACHED SPRINKLER LITERATURE)**	
DENSITY (GPM/SQ FT): **0.15**	OPERATING AREA (SQ FT): **Entire Canopy Ceiling**
AREA PER SPRINKLER (SQ FT): **130**	TOTAL SPRINKLERS OPERATING: **17**
MIN. FLOW PER HEAD (GPM): **N/A**	MIN. PRESSURE PER HEAD (PSI): **N/A**
INSIDE HOSE ALLOWANCE (GPM): **0**	OUTSIDE HOSE ALLOWANCE (GPM): **250**
OVERHEAD PIPING C-FACTOR: **100/120**	UNDERGROUND PIPING C-FACTOR: **140**

CALCULATION SUMMARY		
DEMAND @: **Base of Riser**	FLOW REQ'D (GPM): **597.45**	PRESSURE REQ'D (PSI): **50.123**
DEMAND @: **Conn to City Main**	FLOW REQ'D (GPM): **597.45**	PRESSURE REQ'D (PSI): **59.258**
AREA SAFETY MARGIN (PSI): **12.055**		

NOTES:	PE STAMP

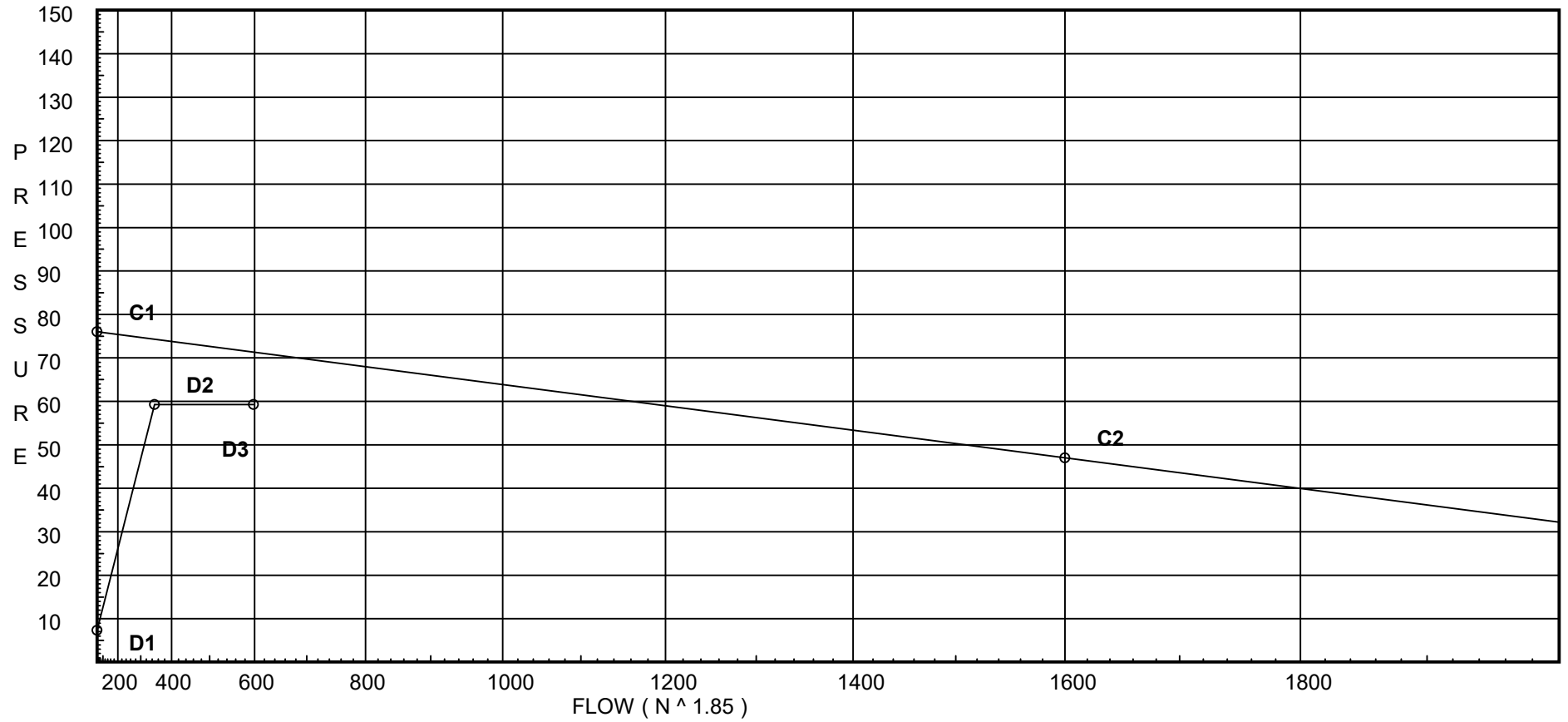
Water Supply Curve C

BIC Design Company
The Princeton Area #20 - 0.15 for Entire Canopy

Date

City Water Supply:
- C1 - Static Pressure : 76
- C2 - Residual Pressure: 47
- C2 - Residual Flow : 1600

Demand:
- D1 - Elevation : 7.328
- D2 - System Flow : 347.447
- D2 - System Pressure : 59.258
- Hose (Demand) : 250
- D3 - System Demand : 597.447
- Safety Margin : 12.055



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50							
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zwe	Watts 757 Horiz	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Pressure / Flow Summary - STANDARD

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
DP01	16.0	5.6	12.13	na	19.5	0.15	130	7.0
EQ01	16.92		12.15	na				
B01	16.92	K = K @ EQ01	12.15	na	19.5			
B02	16.92	K = K @ EQ01	12.63	na	19.88			
B03	16.92	K = K @ EQ01	12.17	na	19.51			
B04	16.92	K = K @ EQ01	12.65	na	19.9			
B05	16.92	K = K @ EQ01	12.23	na	19.57			
B06	16.92	K = K @ EQ01	12.72	na	19.95			
B07	16.92	K = K @ EQ01	12.36	na	19.67			
B08	16.92	K = K @ EQ01	12.86	na	20.06			
B09	16.92	K = K @ EQ01	12.6	na	19.86			
B10	16.92	K = K @ EQ01	13.11	na	20.25			
B11	16.92	K = K @ EQ01	12.94	na	20.13			
B12	16.92	K = K @ EQ01	13.46	na	20.52			
B13	16.92	K = K @ EQ01	13.44	na	20.51			
B14	16.92	K = K @ EQ01	13.97	na	20.91			
B15	16.92	K = K @ EQ01	14.13	na	21.03			
B16	16.92	K = K @ EQ01	14.69	na	21.44			
B17	12.17	5.6	19.52	na	24.74	0.1	150	7.0
701	16.92		14.18	na				
702	16.92		14.18	na				
703	16.92		14.2	na				
704	16.92		14.21	na				
705	16.92		14.22	na				
706	16.92		14.28	na				
707	16.92		14.28	na				
708	16.92		14.39	na				
709	16.92		14.43	na				
710	16.92		14.5	na				
711	16.92		14.7	na				
712	16.92		14.71	na				
713	16.92		15.1	na				
714	16.92		15.67	na				
715	16.92		16.47	na				
716	16.92		17.52	na				
716A	13.04		21.17	na				
717	13.04		23.04	na				
718	8.125		37.51	na				
719	5.0		45.09	na				
HDR	5.0		45.89	na	250.0			
BOR	1.0		50.12	na				
UG1	0.0		53.37	na				
UG2	0.0		53.85	na				
UG3	0.0		53.79	na				
UG4	0.0		53.67	na				
UG5	0.0		53.63	na				
BFP	0.0		54.8	na				
TEST	0.0		59.26	na				

The maximum velocity is 13.45 and it occurs in the pipe between nodes HDR and BOR

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
DP01	19.50	1.049	E	1.427	1.000	12.125		K Factor = 5.60
to		100.0		0.0	1.427	-0.398		
EQ01	19.5	0.1739		0.0	2.427	0.422		Vel = 7.24
	0.0							
	19.50					12.149		K Factor = 5.59
B01	19.50	1.049	T	3.568	8.130	12.149		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
702	19.5	0.1740		0.0	11.698	2.035		Vel = 7.24
	0.0							
	19.50					14.184		K Factor = 5.18
B02	19.88	1.049	T	3.568	5.030	12.633		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
702	19.88	0.1804		0.0	8.598	1.551		Vel = 7.38
	0.0							
	19.88					14.184		K Factor = 5.28
B03	19.51	1.049	T	3.568	8.130	12.167		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
704	19.51	0.1742		0.0	11.698	2.038		Vel = 7.24
	0.0							
	19.51					14.205		K Factor = 5.18
B04	19.90	1.049	T	3.568	5.030	12.652		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
704	19.9	0.1806		0.0	8.598	1.553		Vel = 7.39
	0.0							
	19.90					14.205		K Factor = 5.28
B05	19.57	1.049	T	3.568	8.130	12.234		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
707	19.57	0.1751		0.0	11.698	2.048		Vel = 7.26
	0.0							
	19.57					14.282		K Factor = 5.18
B06	19.95	1.049	T	3.568	5.030	12.721		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
707	19.95	0.1816		0.0	8.598	1.561		Vel = 7.41
	0.0							
	19.95					14.282		K Factor = 5.28
B07	19.67	1.049	T	3.568	8.130	12.363		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
709	19.67	0.1769		0.0	11.698	2.069		Vel = 7.30
	0.0							
	19.67					14.432		K Factor = 5.18
B08	20.06	1.049	T	3.568	5.030	12.856		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
709	20.06	0.1833		0.0	8.598	1.576		Vel = 7.45
	0.0							
	20.06					14.432		K Factor = 5.28
B09	19.86	1.049	T	3.568	8.130	12.604		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
712	19.86	0.1800		0.0	11.698	2.106		Vel = 7.37

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
	0.0							
	19.86					14.710		K Factor = 5.18
B10	20.25	1.049	T	3.568	5.030	13.105		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
712	20.25	0.1867		0.0	8.598	1.605		Vel = 7.52
	0.0							
	20.25					14.710		K Factor = 5.28
B11	20.13	1.049	T	3.568	8.130	12.941		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
713	20.13	0.1845		0.0	11.698	2.158		Vel = 7.47
	0.0							
	20.13					15.099		K Factor = 5.18
B12	20.52	1.049	T	3.568	5.030	13.455		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
713	20.52	0.1912		0.0	8.598	1.644		Vel = 7.62
	0.0							
	20.52					15.099		K Factor = 5.28
B13	20.51	1.049	T	3.568	8.130	13.438		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
714	20.51	0.1910		0.0	11.698	2.234		Vel = 7.61
	0.0							
	20.51					15.672		K Factor = 5.18
B14	20.91	1.049	T	3.568	5.030	13.970		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
714	20.91	0.1980		0.0	8.598	1.702		Vel = 7.76
	0.0							
	20.91					15.672		K Factor = 5.28
B15	21.03	1.049	T	3.568	8.130	14.134		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
715	21.03	0.2000		0.0	11.698	2.340		Vel = 7.81
	0.0							
	21.03					16.474		K Factor = 5.18
B16	21.44	1.049	T	3.568	5.030	14.691		K Factor @ node EQ01
to		100.0		0.0	3.568	0.0		
715	21.44	0.2074		0.0	8.598	1.783		Vel = 7.96
	0.0							
	21.44					16.474		K Factor = 5.28
B17	24.74	1.049	E	1.427	2.500	19.519		K Factor = 5.60
to		100.0	T	3.568	4.995	-0.377		
716A	24.74	0.2703		0.0	7.495	2.026		Vel = 9.18
	0.0							
	24.74					21.168		K Factor = 5.38
701	0.0	3.26		0.0	1.880	14.184		
to		100.0		0.0	0.0	0.0		
702	0.0	0.0		0.0	1.880	0.0		Vel = 0
702	39.38	3.26		0.0	4.120	14.184		
to		100.0		0.0	0.0	0.0		
703	39.38	0.0027		0.0	4.120	0.011		Vel = 1.51

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*******	Notes	******
703	0.0	3.26		0.0	4.040	14.195				
to		100.0		0.0	0.0	0.0				
704	39.38	0.0025		0.0	4.040	0.010		Vel = 1.51		
704	39.42	3.26		0.0	2.000	14.205				
to		100.0		0.0	0.0	0.0				
705	78.8	0.0095		0.0	2.000	0.019		Vel = 3.03		
705	0.0	3.26		0.0	6.000	14.224				
to		100.0		0.0	0.0	0.0				
706	78.8	0.0092		0.0	6.000	0.055		Vel = 3.03		
706	0.0	3.26		0.0	0.330	14.279				
to		100.0		0.0	0.0	0.0				
707	78.8	0.0091		0.0	0.330	0.003		Vel = 3.03		
707	39.52	3.26		0.0	5.670	14.282				
to		100.0		0.0	0.0	0.0				
708	118.32	0.0196		0.0	5.670	0.111		Vel = 4.55		
708	0.0	3.26		0.0	2.000	14.393				
to		100.0		0.0	0.0	0.0				
709	118.32	0.0195		0.0	2.000	0.039		Vel = 4.55		
709	39.73	3.26		0.0	2.000	14.432				
to		100.0		0.0	0.0	0.0				
710	158.05	0.0335		0.0	2.000	0.067		Vel = 6.08		
710	0.0	3.26		0.0	6.000	14.499				
to		100.0		0.0	0.0	0.0				
711	158.05	0.0333		0.0	6.000	0.200		Vel = 6.08		
711	0.0	3.26		0.0	0.330	14.699				
to		100.0		0.0	0.0	0.0				
712	158.05	0.0333		0.0	0.330	0.011		Vel = 6.08		
712	40.11	3.26		0.0	7.670	14.710				
to		100.0		0.0	0.0	0.0				
713	198.16	0.0507		0.0	7.670	0.389		Vel = 7.62		
713	40.65	3.26		0.0	8.000	15.099				
to		100.0		0.0	0.0	0.0				
714	238.81	0.0716		0.0	8.000	0.573		Vel = 9.18		
714	41.42	3.26		0.0	8.330	15.672				
to		100.0		0.0	0.0	0.0				
715	280.23	0.0963		0.0	8.330	0.802		Vel = 10.77		
715	42.48	3.26	E	6.714	1.667	16.474				
to		100.0		0.0	6.714	0.0				
716	322.71	0.1250		0.0	8.381	1.048		Vel = 12.40		
716	0.0	3.26	E	6.714	9.000	17.522				
to		100.0		0.0	6.714	1.680				
716A	322.71	0.1251		0.0	15.714	1.966		Vel = 12.40		
716A	24.74	3.26	E	6.714	6.320	21.168				
to		100.0		0.0	6.714	0.0				
717	347.45	0.1433		0.0	13.034	1.868		Vel = 13.36		
717	0.0	3.26	6E	40.285	45.860	23.036				
to		100.0		0.0	40.285	2.129				
718	347.45	0.1434		0.0	86.145	12.349		Vel = 13.36		

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
718	0.0	3.26	Dvc	16.306	3.125	37.514		
to		100.0	B	9.592	40.285	1.353		
719	347.45	0.1434	T	14.388	43.410	6.224		Vel = 13.36
719	0.0	4.26	T	26.334	2.500	45.091		
to		120.0		0.0	26.334	0.0		
HDR	347.45	0.0278		0.0	28.834	0.801		Vel = 7.82
HDR	250.00	4.26	S	28.968	4.000	45.892		Qa = 250
to		120.0		0.0	28.968	1.732		
BOR	597.45	0.0758		0.0	32.968	2.499		Vel = 13.45
BOR	0.0	6.16	2E	40.168	190.000	50.123		
to		140.0	2F	20.084	107.593	0.433		
UG1	597.45	0.0095	T	43.037	297.593	2.814		Vel = 6.43
			G	4.304				
	0.0							
	597.45					53.370		K Factor = 81.78
UG1	521.17	6.16		0.0	65.000	53.370		
to		140.0		0.0	0.0	0.0		
UG2	521.17	0.0074		0.0	65.000	0.478		Vel = 5.61
UG2	-597.45	6.16	2T	86.075	200.000	53.848		
to		140.0		0.0	86.075	0.0		
UG3	-76.28	-0.0002		0.0	286.075	-0.060		Vel = 0.82
UG3	0.0	6.16	5F	50.21	490.000	53.788		
to		140.0		0.0	50.210	0.0		
UG4	-76.28	-0.0002		0.0	540.210	-0.114		Vel = 0.82
UG4	0.0	6.16	T	43.037	165.000	53.674		
to		140.0		0.0	43.037	0.0		
UG5	-76.28	-0.0002		0.0	208.037	-0.043		Vel = 0.82
UG5	0.0	6.16	4F	40.168	1160.000	53.631		
to		140.0	2E	40.168	80.336	0.0		
UG1	-76.28	-0.0002		0.0	1240.336	-0.261		Vel = 0.82
	0.0							
	-76.28					53.370		K Factor = -10.44
UG2	597.45	6.16	2E	40.168	60.000	53.848		
to		140.0		0.0	40.168	0.0		
BFP	597.45	0.0095		0.0	100.168	0.947		Vel = 6.43
BFP	0.0	6.16	2E	40.168	60.000	54.795		
to		140.0	Zwe	0.0	87.509	3.068		* * Fixed Loss = 3.068
TEST	597.45	0.0095	T	43.037	147.509	1.395		Vel = 6.43
			G	4.304				
	0.0							
	597.45					59.258		K Factor = 77.61

VicFlex™ Style VS1 Dry Sprinkler
Models V3505, V3506, V3509, V3510, V3517, V3518

10.91

1.0 PRODUCT DESCRIPTION

Style

- Pendent, Concealed Pendent, Horizontal Sidewall

K Factor

- 5.6/8.1 S.I.
  For system design purposes, no equivalent length calculations are required.

Sprinkler Length

- 38"/965 mm, 50"/1270 mm, 58"/1475 mm

Nominal Orifice Size

- ½"/13 mm

Maximum Working Pressure

- 175 psi/1200 kPa

Factory Hydrostatic Test

- 100% @ 500 psi/3450 kPa

Minimum Operating Pressure

- 7 psi/48 kPa

Connections

- To branch line (inlet) via 1"/25 mm NPT or 1" BSPT

Minimum Bend Radius:

- **UL:** 2"/51 mm
- **FM**: 7"/178 mm

Maximum Number of 90° Bends:

- **UL:** 4
- **FM**: 2 bends for 38", 3 bends for 50", 4 bends for 58"

Hazard Classifications

- Light and Ordinary Hazard

NOTE

- The VS1 is classified as a dry sprinkler and has no equivalent length.

ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.

System No.		Location	
Submitted By		Date	

Spec Section		Paragraph	
Approved		Date	

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2.0 CERTIFICATION/LISTINGS

Approvals/Listings	Model								
	V3505	V3505	V3506	V3506	V3509	V3509	V3510	V3517	V3518
Orifice Size (inches)	½"	½"	½"	½"	½"	½"	½"	½"	½"
Orifice Size (mm)	13	13	13	13	13	13	13	13	13
Nominal K Factor Imperial	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Nominal K Factor S.I.	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Response	Standard	Standard	Quick	Quick	Standard	Standard	Quick	Standard	Quick[1]
Deflector Type	Pendent	Recessed	Pendent	Recessed	Hor. SW	Rec. Hor. SW	Hor. SW, Recessed Hor. Sidewall	Conc. Pend.	Conc. Pend. w/Clean room gasket
Approved Temperature Ratings	**F°/C°**								
FM	135/57	135/57	135/57	135/57	135/57	135/57	135/57	–	135/57
	155/68	155/68	155/68	155/68	155/68	155/68	155/68	–	155/68
	175/79	175/79	175/79	175/79	175/79	175/79	175/79	–	175/79
	200/93	200/93	200/93	200/93	200/93	200/93	200/93	–	200/93
	286/141	–	–	–	286/141	–	–	–	–
UL	135/57	135/57	135/57	135/57	135/57	135/57	135/57	135/57	135/57
	155/68	155/68	155/68	155/68	155/68	155/68	155/68	155/68	155/68
	175/79	175/79	175/79	175/79	175/79	175/79	175/79	175/79	175/79
	200/93	200/93	200/93	200/93	200/93	200/93	200/93	200/93	200/93
	286/141	286/141	286/141	286/141	286/141	–	286/141	–	–

[1] Model V3518 is a Standard Response FM sprinkler.

3.0 MATERIAL SPECIFICATIONS

Deflector: Brass

Bulb: Glass with glycerin solution

Bulb Nominal Diameter:

☐ **Quick Response:** 3.0 mm

☐ **Standard Response:** 5.0 mm

Split Spacers: Stainless steel

Load Screw: Brass

Pip Cap: Stainless steel

Spring Seal Assembly: PTFE tape coated beryllium nickel and stainless steel

Frame: Brass

Flexible Hose: Stainless steel

Collar/Weld Fitting: Stainless steel

Gasket Seal: Victaulic EPDM

Isolation Ring: Nylon

Hose Fittings: Carbon steel, zinc-plated

Inlet Fitting: Brass

Outer Tube: Stainless steel

Concealed Cup: Carbon steel, zinc-plated

Brackets: Carbon steel, zinc-plated

3.1 ACCESSORIES SPECIFICATIONS

Sprinkler Finishes:

☐ **Standard:** VC-250

☐ White painted RAL 9010

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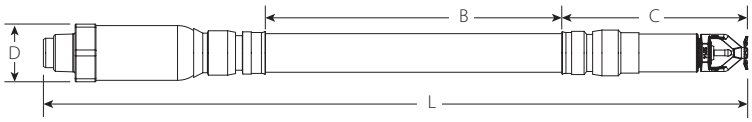
4.0 DIMENSIONS

Product Details and Optional Components

Style VS1 Dry Sprinkler

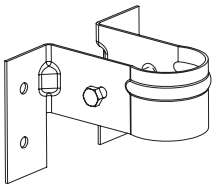


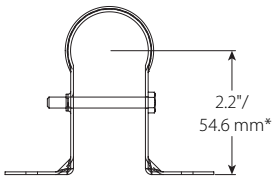
Sprinkler Length inches mm	Overall Length (pendent) L inches mm	Live Length B inches mm	Outlet End Length C inches mm	Maximum OD D inches mm
38 965	39.2 995	25.1 638	6.5 165	2.2 56
50 1270	51.2 1300	37.1 943	6.5 165	2.2 56
58 1475	59.2 1505	45.1 1145	6.5 165	2.2 56

NOTE

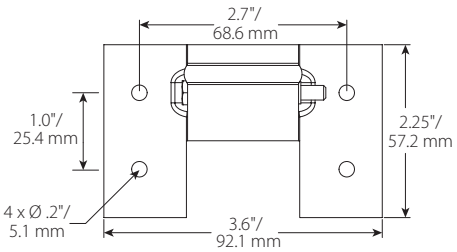
- Add ½" to Overall Length and Outlet End Length for increased length of sidewall deflector

Style VB1 Bracket





*Note: Theoretical center point of sprinkler in bracket.



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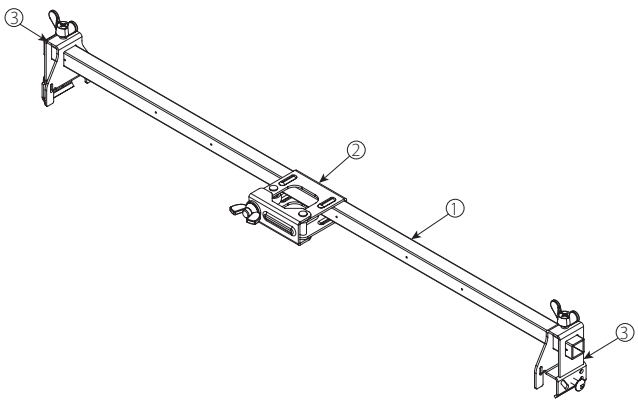
4.0 DIMENSIONS (CONTINUED)

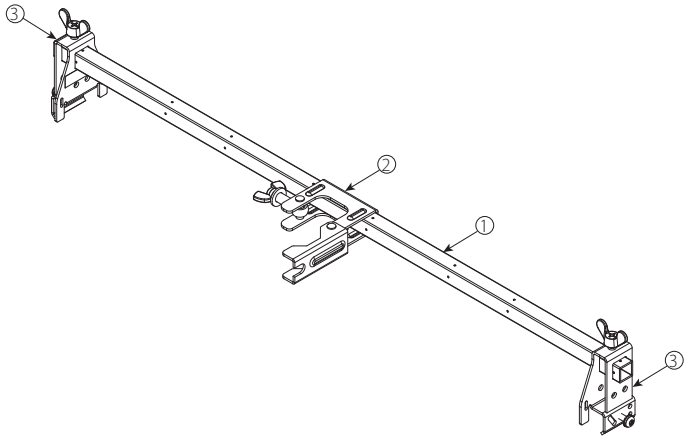
Style VB2 Bracket
Recessed Pendent, Suspended Ceilings

Item	Description
1	24"/610 mm or 48"/1220 mm Square Bar
2	Patented 1-Bee Center Bracket
3	End Bracket



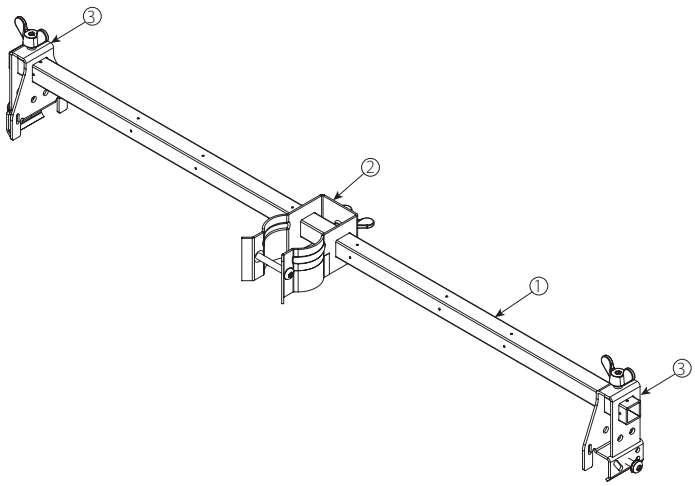
Style VB3 Bracket
Concealed Pendent, Suspended Ceilings

Item	Description
1	24"/610 mm or 48"/1220 mm Square Bar
2	Patented 1-Bee Center Bracket
3	End Bracket



Style VB4 Bracket
Sleeve and Skirt Pendent, Suspended Ceilings

Item	Description
1	24"/610 mm or 48"/1220 mm Square Bar
2	Center Bracket
3	End Bracket



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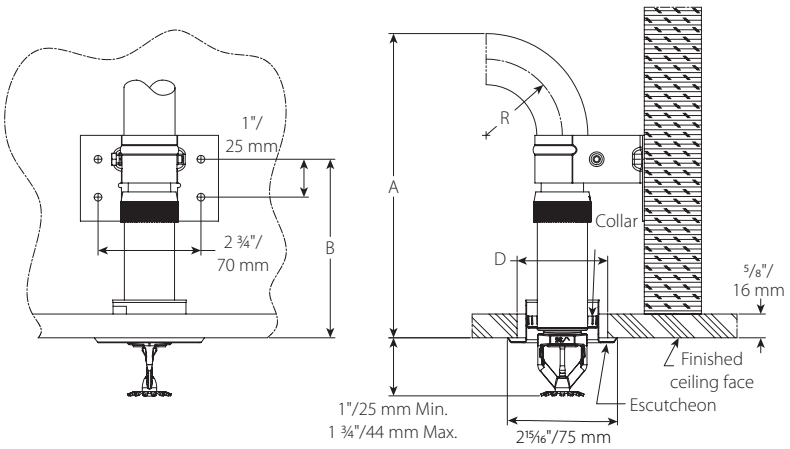
4.1 DIMENSIONS

Sprinkler Finishes: Dimensions and Mounting Conditions

NOTE

- Drawings are shown with ⅝" finished ceiling thickness. Adjustments to "B" and "C" dimensions will be required if finished ceiling thickness deviate from drawing.

Recessed Pendent:



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	7 ⅝ 193	12 ⅝ 320
"B" Mounting Screw Hole Location	4 ¾ 119	
Ceiling Hole Diameter "D"	2 – 2 ⅜ 50 – 60	

NOTE

- Dimensions are shown with ¾" escutcheon at middle of height adjustment range.

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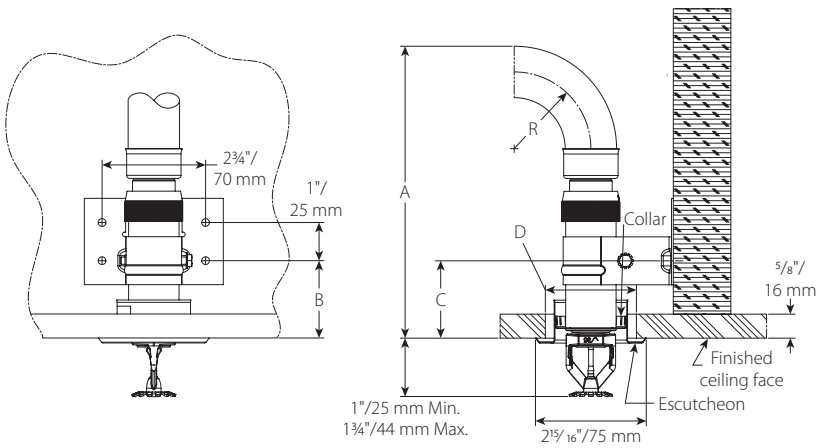
4.2 DIMENSIONS

Recessed Pendent Alternative Bracket Location



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	7⅝ 193	12⅝ 320
"B" Mounting Screw Hole Location	2 50	
Ceiling Hole Diameter "D"	2 – 2⅜ 50 – 60	

NOTE

- Dimensions are shown with ¾" escutcheon at middle of height adjustment range.

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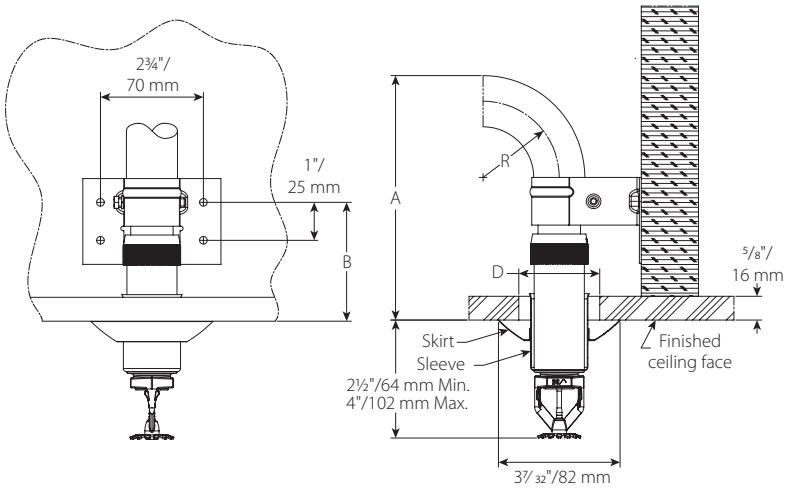
4.3 DIMENSIONS

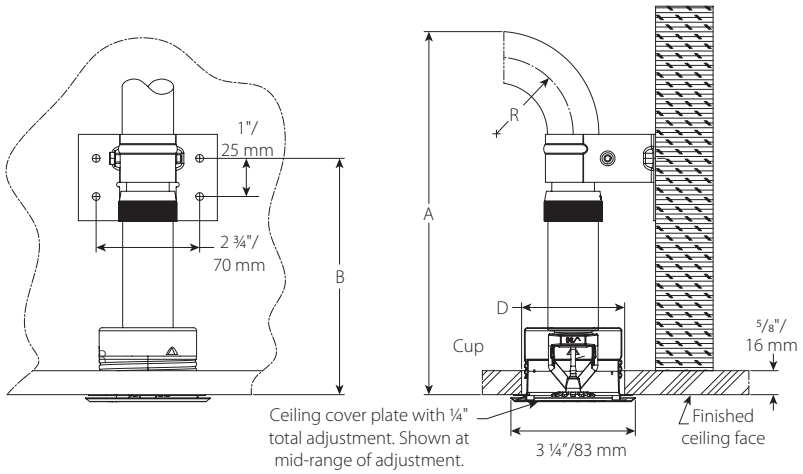
Sleeve and Skirt Pendent



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	6½ 163	11½ 290
"B" Mounting Screw Hole Location	3⅛ 79	
Ceiling Hole Diameter "D"	1¾ – 2⅛ 44 – 54	

4.4 DIMENSIONS

Concealed Pendent



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	9½ 241	14½ 369
"B" Mounting Screw Hole Location	6¼ 157	
Ceiling Hole Diameter "D"	2⅝ – 2¾ 67 – 70	

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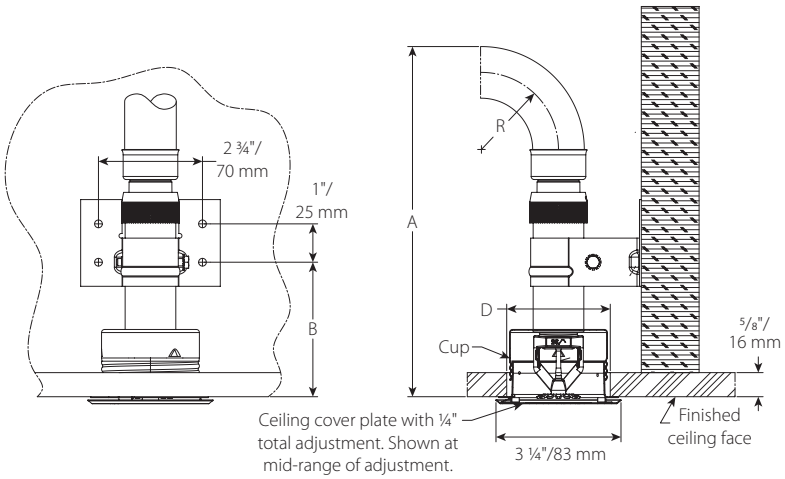
4.5 DIMENSIONS

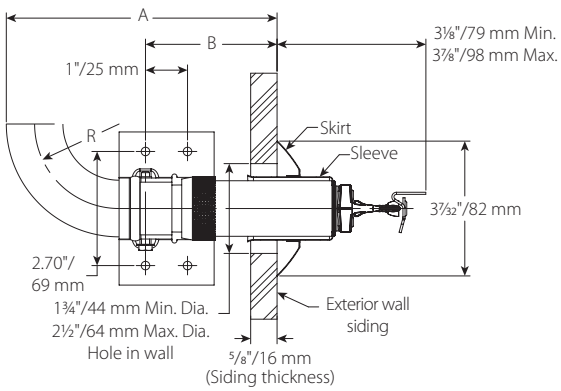
Concealed Pendent Alternative Bracket Location



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	9 ⅛ 231	14 ⅛ 358
"B" Mounting Screw Hole Location	3 ½ 89	
Ceiling Hole Diameter "D"	2 ⅝ – 2 ¾ 67 – 70	

4.6 DIMENSIONS

Sleeve and Skirt Sidewall



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	6 ½ 163	11 ½ 290
"B" Mounting Screw Hole Location	3 ⅛ 79	
Ceiling Hole Diameter "D"	1 ¾ – 2 ⅛ 44 – 54	

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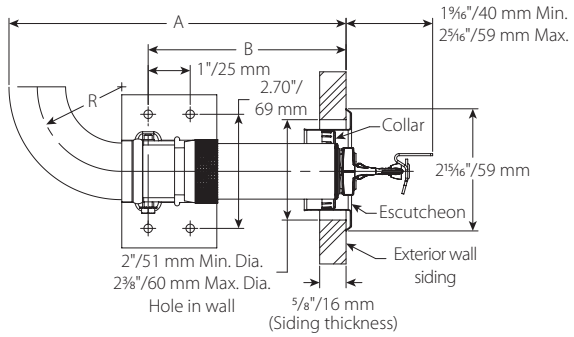
4.7 DIMENSIONS

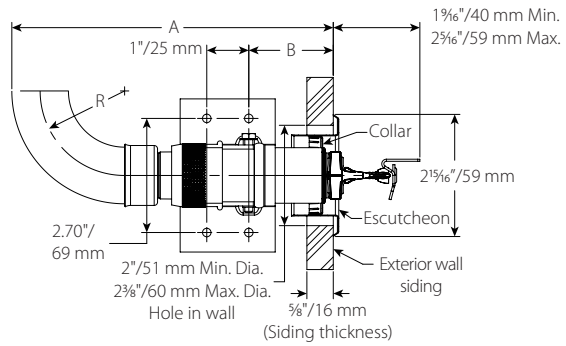
Recessed Sidewall



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	8 203	13 330
"B" Mounting Screw Hole Location	4 ¾ 119	
Ceiling Hole Diameter "D"	2 – 2 ⅜ 51 – 60	

4.8 DIMENSIONS

Recessed Sidewall Alternative Bracket Location



Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	8 203	13 330
"B" Mounting Screw Hole Location	2 51	
Ceiling Hole Diameter "D"	2 – 2 ⅜ 51 – 60	

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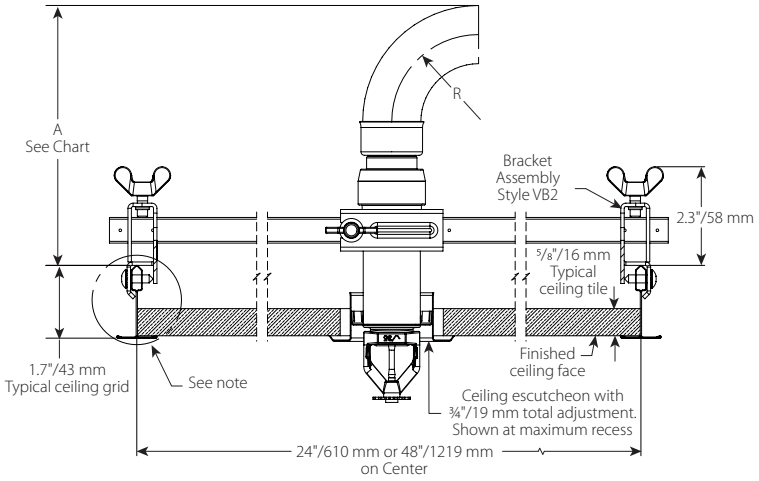
4.9 DIMENSIONS

VB2 Recessed Pendent



Recessed Pendent

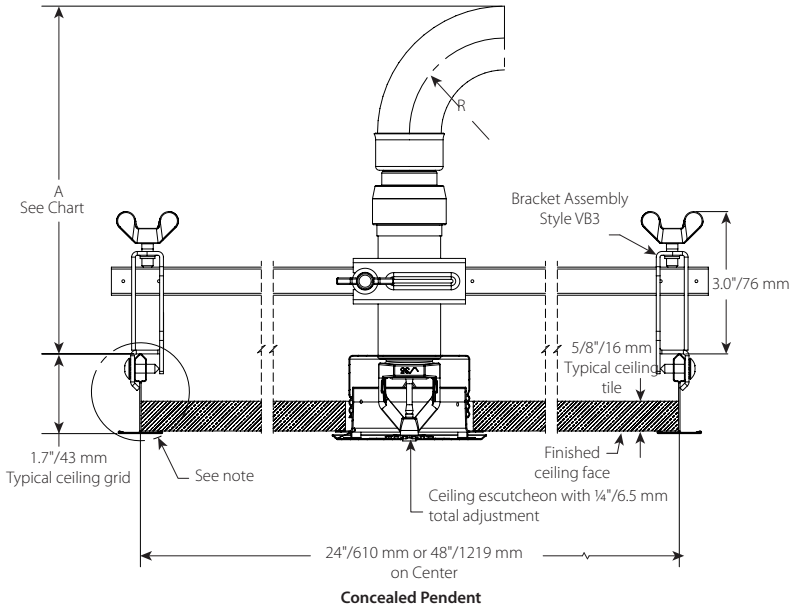
Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	6½ 163	11½ 290

NOTE

- Victaulic *VicFlex* Style VB2 Bracket assemblies shall be used only with Style VS1 recessed pendent sprinklers.

4.10 DIMENSIONS

VB3 Concealed Pendent



Concealed Pendent

Clearance Chart		
Dimension	inches mm	
"R" Minimum Bend Radius	2 50	7 175
"A" Minimum Required Installation Space	7⅝ 193	12⅝ 320

NOTE

- Victaulic *VicFlex* Style VB3 Bracket assemblies shall be used only with Style VS1 concealed pendent sprinklers.

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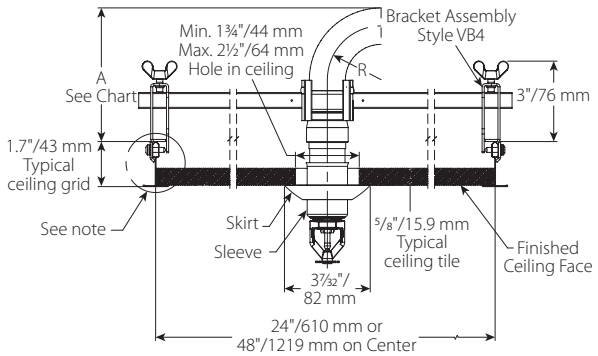
4.11 DIMENSIONS

VB4 Sleeve and Skirt Pendent



Sleeve and Skirt Pendent

Clearance Chart		
Bend Radius		
	inches mm	inches mm
"R" Minimum Bend Radius	2 51	7 178
"A" Minimum Required Installation Space	5 127	10 254

NOTE

- Victaulic *VicFlex* Style VB2 Bracket assemblies shall be used only with Style VS1 recessed pendent sprinklers.

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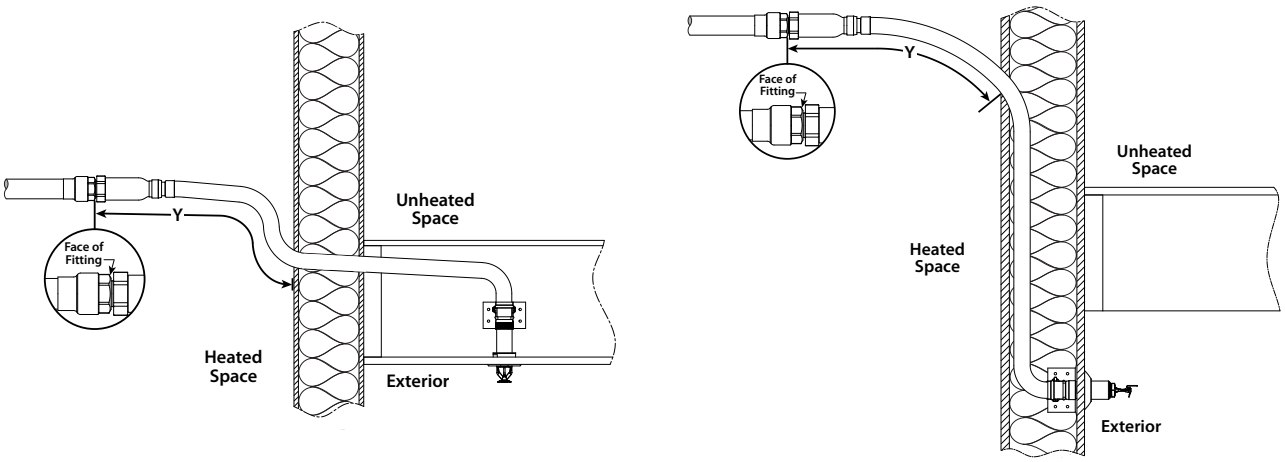
5.0 PERFORMANCE

Freeze Protection



Ambient Temperature Exposed to Discharge End of Sprinkler °F °C	Exposed Minimum Barrel Length "Y" inches mm		
	40°F/4°C	50°F/10°C	60°F/16°C
40 4	0 0	0 0	0 0
30 -1	0 0	0 0	0 0
20 -7	4 100	0 0	0 0
10 -12	8 200	1 25	0 0
0 -18	12 300	3 75	0 0
-10 -23	14 350	4 100	1 25
-20 -29	14 350	6 150	3 75
-30 -34	16 400	8 200	4 100
-40 -40	18 450	8 200	4 100
-50 -46	20 500	10 250	6 150
-60 -51	20 500	10 250	6 150

NOTE

- Exposed minimum barrel lengths are inclusive up to 30-mph/48-kph wind velocities.

Maximum Allowable Number of Bends

Sprinkler Length inches mm	Maximum Allowable Number of 90° Bends at 2"/51mm Bend Radius for UL Listing	Maximum Allowable Number of 90° Bends at 7"/178mm Bend Radius for FM Approval
38 965	4	2
50 1270	4	3
58 1475	4	4

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6.0 NOTIFICATIONS

WARNING

- **Read and understand all instructions before attempting to install any Victaulic products.**
- **Always verify that the piping system has been completely depressurized and drained immediately prior to installation, removal, adjustment, or maintenance of any Victaulic products.**
- **Wear safety glasses, hardhat, and foot protection.**

- **These products shall be used only in fire protection systems that are designed and installed in accordance with current, applicable National Fire Protection Association (NFPA 13, 13D, 13R, etc.) standards, or equivalent standards, and in accordance with applicable building and fire codes. These standards and codes contain important information regarding protection of systems from freezing temperatures, corrosion, mechanical damage, etc.**
- **The installer shall understand the use of this product and why it was specified for the particular application.**
- **The installer shall understand common industry safety standards and potential consequences of improper product installation.**

WARNING

- **It is the responsibility of the system designer to verify suitability of 300-series stainless steel flexible hose for use with the intended fluid media within the piping system and external environments.**
- **The effect of chemical composition, pH level, operating temperature, chloride level, oxygen level, and flow rate on 300-series stainless steel flexible hose must be evaluated by the material specifier to confirm system life will be acceptable for the intended service.**
- **It is the responsibility of the owner of a building or their authorized agent to provide the sprinkler system installer with any knowledge that the water supply might be contaminated with or conducive to the development of microbiologically influenced corrosion (MIC), including as required by NFPA 13. Failure to identify adverse water quality issues may affect the VicFlex product and void the manufacturer's warranty.**

Failure to follow these instructions could cause product failure, resulting in serious personal injury and/or property damage.

DO NOT paint, coat, or firestop the outlet/inlet portion of the Style VS1 Dry Sprinkler. Braided hose and fitting portions of the Style VS1 Dry Sprinkler may be painted or coated, provided that the paint or coating is compatible with stainless steel material. This includes penetration through firestop-filled annular space of a firewall. The firestop material in direct contact with the flexible braided hose will not impede functionality of the Style VS1 Dry Sprinkler, provided that the components are installed in accordance with Victaulic's installation instructions.

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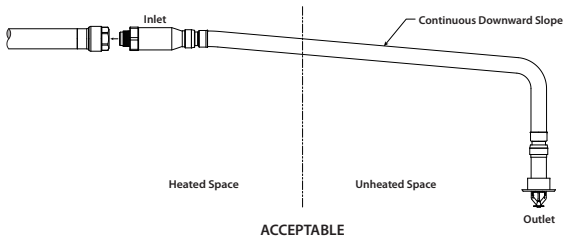
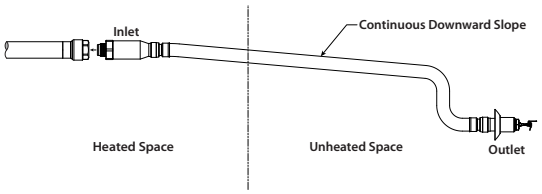
6.0 NOTIFICATIONS (CONTINUED)

Important Installation Notes:

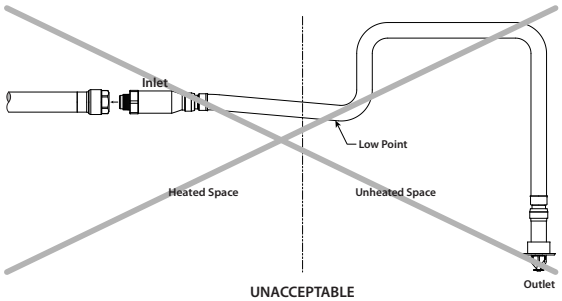
1. Shall be installed only in accordance with NFPA 13 Standard for the the Installation of Sprinkler Systems and applicable FM Data Sheets.
2. Install and tighten swivel hex nut at inlet of sprinkler fitting only.
3. Do not remove deflector or inlet end of sprinkler.



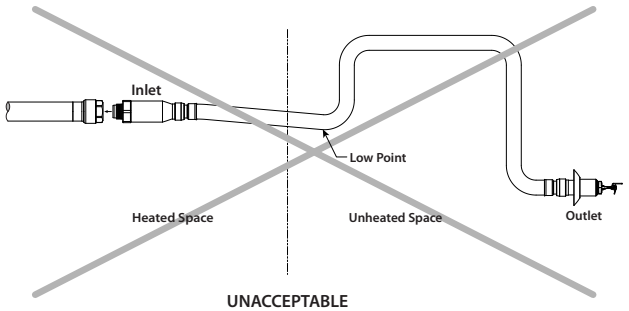
ACCEPTABLE



ACCEPTABLE



UNACCEPTABLE



UNACCEPTABLE

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6.0 NOTIFICATIONS (CONTINUED)

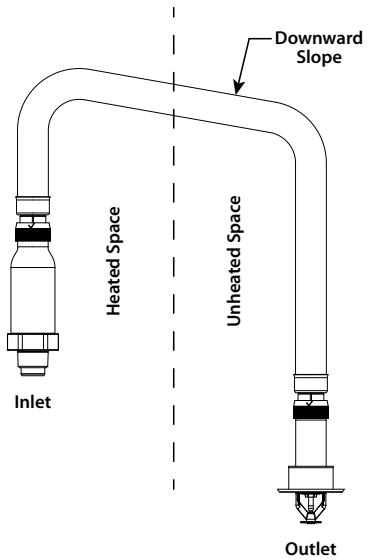
FOR DRY SYSTEMS ONLY:

- The Style VS1 Dry Sprinkler's inlet shall be installed only into the outlet of a fitting (excluding elbows) or welded outlet that meets the dimensional requirements of ANSI B16.3 and ANSI B16.4, Class 125 and Class 150. Use a sample fitting to confirm proper engagement and to verify that there is no interference between the sprinkler and the fitting.

Style VS1 Dry Sprinklers in an unheated space shall be installed with a continuous downward slope along its entire length from the branch line fitting to the sprinkler. No localized low points shall be present along the length of the Style VS1 Dry Sprinkler.

Style VS1 Dry Sprinklers in an unheated space are not permitted to be installed into the top of the branch line piping. Style VS1 Dry Sprinklers shall be installed into the side or from the bottom of the branch line piping.

In a heated space, if a portion of the Style VS1 Dry Sprinkler is installed from the top of a branch line and then extends into an unheated space, it shall be installed with a continuous downward slope along the entire length from the inside wall to the outlet of the sprinkler. No localized low points shall be present along the length of the sprinkler in the unheated space. Refer to the drawing below.



FOR WET SYSTEMS ONLY:

- **DO NOT** install Victaulic® VicFlex™ Style VS1 Dry Sprinklers into any threaded elbow, threaded-by-thread coupling, or fitting that interferes with thread penetration. The inlet of the Victaulic® VicFlex™ Style VS1 Dry Sprinkler **SHALL NOT** bottom out in the fitting. Use a sample fitting to confirm proper engagement.
- To ensure unobstructed flow during operation, the Victaulic® VicFlex™ Style VS1 Dry Sprinkler shall be installed into a fitting that will prevent water and debris from accumulating at the dry sprinkler's inlet.
- Verify that the exposed minimum barrel length in the heated space is measured and maintained in accordance with the table on page 1.

In a heated space, if a portion of the Style VS1 Dry Sprinkler extends into an unheated space, it shall be installed with a continuous downward slope along the entire length from the inside wall to the outlet end of the dry sprinkler. No localized low points shall be present along the length of the sprinkler in the unheated space. Refer to the drawing above.

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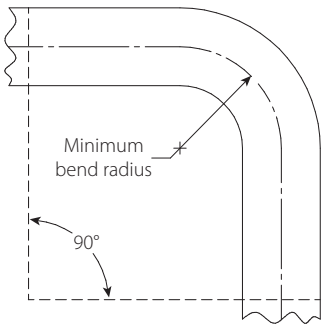
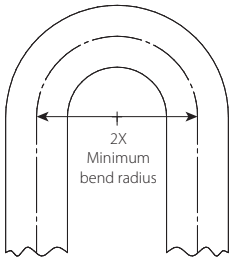
7.0 REFERENCE MATERIALS

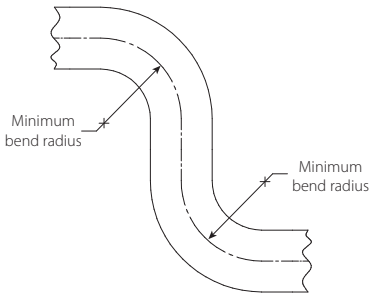
ONE BEND

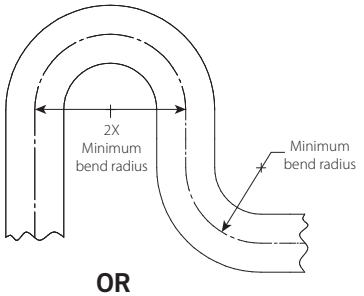


TWO BENDS

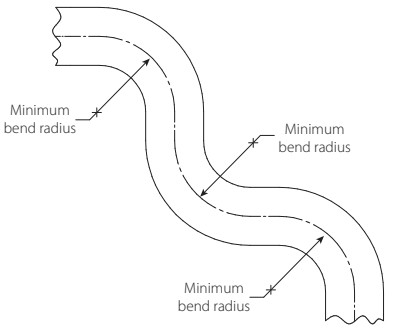


OR





OR



NOTE

For out-of-plane (three-dimensional) bends, care must be taken to avoid imparting torsional stress on the sprinkler.

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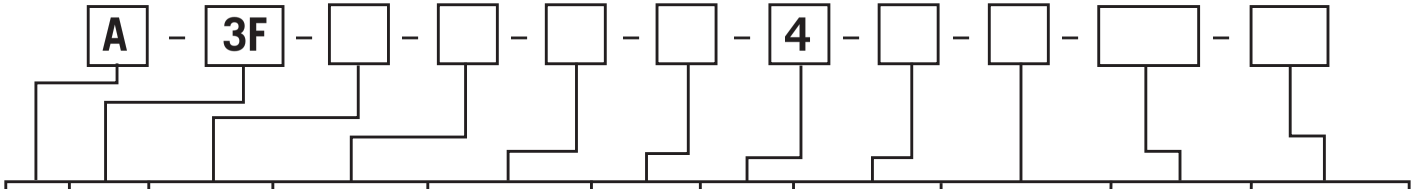
Bill To:	
Company Name	
Address	
State/Province	Zip Code/Postal Code
Phone No.	Email
Fax No.	

Ship To:	
Order No.	Date
Company Name	
Address	
State/Province	Zip Code/Postal Code
Tag	

Quantity (as specified below): ☐ If units of different size, type or other option are required, please attach additional form(s) with their specification(s) separately.

VicFlex™ Dry Sprinkler Model VS1



Class	Style	Thread	Deflector Style	Temperature	Response	K Factor	Finish	Recessed Escutcheon Material	Size		Escutcheon Style †
									Code	Inches	
A	3F = V35	3 = 1" NPT 8 = 25 mm BSP	B = Pendent C = Horizontal Sidewall P - Concealed	A = 135°F/57°C C = 155°F/68°C E = 175°F/79°C F = 200°F/93°C J = 286°F/141°C	Q = Quick S = Std.	4 = K5.6	4 = White N = VC-250 ‡	W = White Stainless Steel X = Stainless Steel 0 = Concealed	380 = 38" 500 = 50" 580 = 58"		12 = Recessed 13 = Sleeve and Skirt 15 = Concealed

‡ VC-250 sprinkler finish sold standard on the VicFlex Dry Sprinkler Model VS1.

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7.0 REFERENCE MATERIALS (CONTINUED)

29.01: Victaulic Terms and Conditions of Sale

I-VICFLEX.VS1: Victaulic® VicFlex™ Style VS1 Dry Sprinkler Installation Instructions

User Responsibility for Product Selection and Suitability
Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, and the applicable building codes and related regulations as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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Note
This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

Installation
Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

Warranty
Refer to the Warranty section of the current Price List or contact Victaulic for details.

Trademarks
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MODEL V-BB SPECIFIC APPLICATION ATTIC SPRINKLER

TECHNICAL DATA

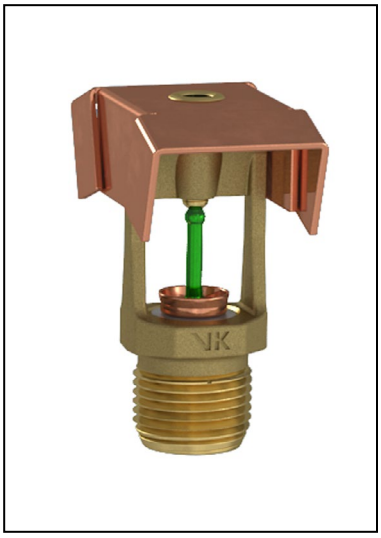
The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com.

1. DESCRIPTION

The Model V-BB (Back to Back) is a Specific Application Attic Sprinkler designed to provide superior fire protection in combustible and non-combustible sloped attic spaces when compared to standard spray attic protection. With specific application criteria for use with Model V-SD (Single Directional) and VK696 Attic Upright Specific Application Sprinklers, Viking attic sprinklers provide an extended coverage spacing alternative to standard spray sprinklers. They make it possible to use a single line of piping at the attic peak, eliminating the need for branch lines and greatly reducing the number of required sprinklers and associated material and installation costs. Model V-BB sprinklers also have lower minimum flow and pressure requirements than competitive products.

Viking Attic Sprinklers can be installed with either steel or CPVC piping (CPVC allowed on wet pipe systems only), and are available in brass or with corrosion-resistant Electroless Nickel PTFE (ENT) coatings where salt water and other corrosive elements are a consideration. They are cULus Listed with specific application guidelines for use as special sprinklers as defined by the National Fire Protection Association (NFPA), and are cULus Listed for extended coverage in combustible and non-combustible construction. The cULus Listing was achieved using full-scale fire tests within wood truss construction.

The Model V-BB Attic Sprinkler provides a reduced response time due to its narrow ridge spacing of 6 ft. (1,8 m) and long throw pattern (up to 30 ft. in each direction measured horizontally), and is offered in three different slope ranges and two different orifice sizes (K=5.6 or 8.0). Listed for specific pitches 4:12<7:12, 7:12<10:12, and 10:12≤12:12; and spans of 60 ft. and 40 ft. The 8.0K can protect up to 80 ft. span when used along with the Model Attic Upright VK696.



V-BB Sprinkler		
8.0K	**5.6K**	**Pitch**
VK681	VK684	4:12 < 7:12
VK682	VK685	7:12 < 10:12
VK683	VK686	10:12 ≤ 12:12

WARNING: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

2. LISTINGS AND APPROVALS

cULus Listed: Category VNIV

Refer to the Approval Chart on page 4.

3. TECHNICAL DATA

Specifications:

Minimum Operating Pressure: See Design Criteria - UL
Rated to 175 psi (12 bar) water working pressure
Factory tested hydrostatically to 500 psi (34.5 bar)
Thread size: 1/2” (15 mm) or 3/4” (19 mm) NPT
Nominal K-Factor: 5.6 U.S. (80.6 metric*) or 8.0 (115.2 metric*)

* 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.

Glass-bulb fluid temperature rated to -65 °F (-55 °C)
Overall Length: 2-5/8” (67,6 mm)
Covered by the following US Patent No.: 9,149,818

Material Standards:

Frame Casting: Brass UNS-C84400 or QM Brass
Deflector: Brass UNS-C23000
Bulb: Glass, nominal 3 mm diameter
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with Teflon Tape
Screw: Brass UNS-C36000
Pip Cap and Insert Assembly: Copper UNS-C11000 and Stainless Steel UNS-S30400

Ordering Information: (Also refer to the current Viking price list.)

To order the Attic Sprinkler, add the appropriate suffix for the sprinkler finish and then the appropriate suffix for the temperature rating to the sprinkler base part number.
Finish Suffix: Brass = A, ENT = JN
Temperature Suffix: E = 200 °F (93.3 °C)

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Available Finishes And Temperature Ratings:
Refer to the approval chart on page 4.

Accessories: (Also refer to the "Sprinkler Accessories" section of the Viking website under Technical Data)

Sprinkler Wrench:
Standard Wrench: Part No. 10896W/B

Sprinkler Cabinets:
A. Six-head capacity: Part No. 01724A
B. Twelve-head capacity: Part No. 01725A

4. INSTALLATION

Refer to appropriate NFPA Installation Standards.

5. OPERATION

During a fire condition, the heat sensitive liquid in the glass bulb expands, causing the glass to shatter, releasing the pip cap and sealing spring assembly. Water flowing through the sprinkler orifice strikes the deflector, forming a uniform spray pattern to extinguish or control the fire, and protect the piping in the interstitial space.

6. INSPECTIONS, TESTS AND MAINTENANCE

Refer to NFPA 25 for Inspection, Testing and Maintenance requirements.

7. AVAILABILITY

The Model V-BB Specific Application Sprinkler is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

8. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

TABLE 1: AVAILABLE SPRINKLER TEMPERATURE RATINGS AND FINISHES

Sprinkler Temperature Classification	Sprinkler Nominal Temperature Rating[1]	Maximum Ambient Ceiling Temperature[2]	Bulb Color
Intermediate	200 °F (93.3 °C)	150 °F (65°C)	Green
Sprinkler Finishes: Brass, ENT[3]			

Footnotes

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

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

[3] cULus Listed as corrosion resistant.

TECHNICAL DATA

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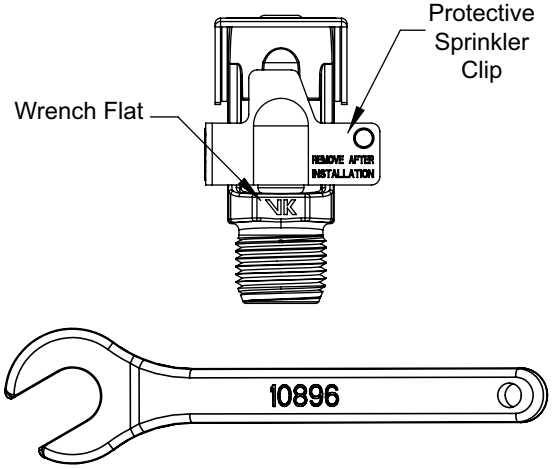

Figure 1:
Standard Sprinkler Wrench 10896W/B

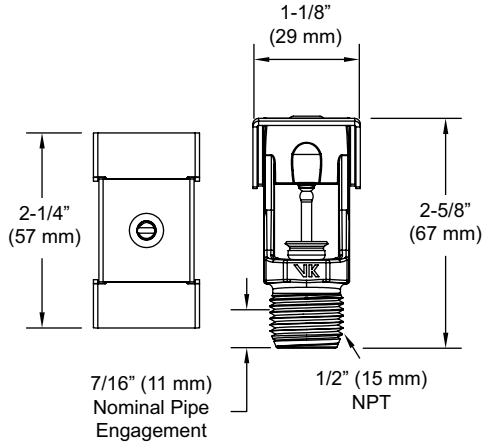

Figure 2a:
Sprinkler Dimensions - 5.6K

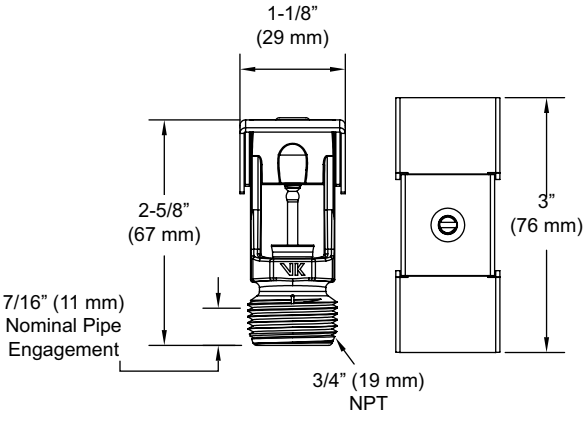

Figure 2b:
Sprinkler Dimensions - 8.0K

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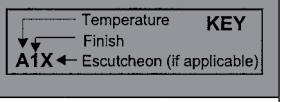
Approval Chart 1

Viking V-BB Specific Application Sprinkler
For Combustible and Non-Combustible Sloped Attic Spaces



Part Number[1]	SIN	Maximum Pressure	Thread Size		Nominal K-Factor		Overall Length		Listings and Approvals[3]				
			NPT	BSP	U.S.	metric[2]	Inches	mm	cULus[4]	FM	LPCB	CE	
19627	VK684	175 psi	1/2"	15 mm	5.6	80,6	2-5/8	68	A1, A2	--	--	--	--
19801	VK685	175 psi	1/2"	15 mm	5.6	80,6	2-5/8	68	A1, A2	--	--	--	--
19754	VK686	175 psi	1/2"	15 mm	5.6	80,6	2-5/8	68	A1, A2	--	--	--	--
19626	VK681	175 psi	3/4"	20 mm	8.0	115,2	2-5/8	68	A1, A2	--	--	--	--
19798	VK682	175 psi	3/4"	20 mm	8.0	115,2	2-5/8	68	A1, A2	--	--	--	--
19751	VK683	175 psi	3/4"	20 mm	8.0	115,2	2-5/8	68	A1, A2	--	--	--	--

Approved Temperature Rating	Approved Finishes
A - 200 °F (93.3 °C)	1 - Brass, 2 - ENT[5]

[1] Also refer to Viking's current 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 table shows the listings and approvals available at the time of printing. Other approvals may be in process.

[4] Listed by Underwriters Laboratories Inc for use in the United States and Canada.

[5] cULus Listed as corrosion resistant.

DESIGN CRITERIA - UL Chart 1

(Also refer to Approval Chart 1)
Allowable , flow, pressure and slope for attic protection using Viking V-BB Sprinklers

Sprinkler Base Part Number	SIN	Type	Thread Size		Nominal K-Factor		Allowable Roof Span[2] ft. (m)	Minimum Flow		Minimum Pressure		Pitch[1]	Dry Pipe System Maximum Water Delivery Time[3] (in seconds)
			NPT	BSP	U.S.	metric		GPM	LPM	PSI	BAR		
19627	VK684	V-BB	1/2"	15 mm	5.6	80,6	≤40 (12,2)	24	91	18.4	1,3	4:12 < 7:12	See footnote 3
19801	VK685	V-BB	1/2"	15 mm	5.6	80,6	≤40 (12,2)	24	91	18.4	1,3	7:12 < 10:12	See footnote 3
19754	VK686	V-BB	1/2"	15 mm	5.6	80,6	≤40 (12,2)	24	91	18.4	1,3	10:12 ≤ 12:12	See footnote 3
19626	VK681	V-BB	3/4"	20 mm	8.0	115,2	≤60 (18,3)	38	144	22.6	1,5	4:12 < 7:12	See footnote 3
19798	VK682	V-BB	3/4"	20 mm	8.0	115,2	≤60 (18,3)	38	144	22.6	1,5	7:12 < 10:12	See footnote 3
19751	VK683	V-BB	3/4"	20 mm	8.0	115,2	≤60 (18,3)	38	144	22.6	1,5	10:12 ≤12:12	See footnote 3

[1] Pitch and slope indicate the incline of a roof, expressed as a proportion of the vertical to the horizontal.

[2] Refer to the Viking Attic Upright VK696 data sheet for roof spans over 60 ft (18,29 m) up to 80 ft (24,38 m) wide.

[3] Refer to NFPA 13, 2013, Section 7.2.3.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Also refer to page SR1-3 for general care, installation, and maintenance information. Viking sprinklers are to be installed in accordance with the latest edition of Viking technical data, the appropriate standards of NFPA, LPCB, APSAD, VdS or other similar organizations, and also with the provisions of governmental codes, ordinances, and standards, whenever applicable.

VIKING®	TECHNICAL DATA	MODEL V-BB SPECIFIC APPLICATION ATTIC SPRINKLER

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ADDITIONAL DESIGN CRITERIA - UL Chart 2

(Also refer to DESIGN CRITERA Chart 1)
Allowable roof span, flow, pressure and slope for attic protection using Viking V-BB Sprinklers

Design Criteria: Flow and Pressures refer to Design Chart 1.

System Type:
Wet systems and dry systems.

Antifreeze Systems:
Use only listed antifreeze in accordance with the applicable NFPA standard as follows:

Option 1: Use any listed antifreeze in accordance with the manfacturer's installation instructions.

Option 2: For a Light Hazard Unoccupied attic
1. System Volume ≤200 gal (764 L)
2. Use freezemaster™ antifreeze (refer to Manufacturer's documentation)
3. Viking Attic Sprinklers (V-BB, V-HIP, V-SD, VK696, VK697)
4. Calculate the number of sprinklers in the hydraulically remote area in accordance with wet system criteria.*

*** NOTE:** For systems greater than 40 Gal (151 L), pipe sizing shall be determined using both the Darcy-Weisbach and Hazen-Williams approved hydraulic calculations. Because of the density of freezemaster™ antifreeze, the K-factor must be adjusted, and the friction loss must be considered in the system design.

Piping Types:
Steel (wet and dry) CPVC (wet systems only).
Occupancy Classification: Light hazard only.

Viking V-BB Sprinkler Spacing

Maximum Coverage Area:
400 ft² (37,16 m²) as measured along the slope.
Coverage area is determined by the twice the maximum distance thrown measured along the slope, multiplied by the distance along the branch line.
Example: 60' (18,3 m) span with a 10:12 slope, when measured along the slope provides a distance of approximately 39'-1" (11,9 m). This number must be multiplied by 2 to equal the overall span, which would be approximately 78'-2" (23,8 m).
400 ft² divided by 78'-2" (23,8 m) allows a maximum spacing along the branchline of 5'-1" (15,5 m).

Along the Branch Line:
Minimum Spacing: 4'-0" (1,2 m) between V-BB's and from V-SD's. 7'-0" (2,1 m) from Viking Attic Uprights. 6'-0" (1,8 m) from Standard Spray Sprinklers
Maximum Spacing: 6'-0" (1,8 m) between V-BB's and from V-SD's.

Measured Down the Slope:
Minimum Spacing: 26'-0" (7,9 m) from Viking Attic Uprights and Standard Spray Sprinklers.

Deflector Position below Peak, Ridge, or Deck:
For all roof pitches as per the listing from 4:12 – 12:12 the maximum deflector distance down is 22" (560 mm), and the minimum deflector distance down is 16" (405 mm).

Deflector Position above Scissor Truss:
For all roof pitches as per the listing from 4:12 – 12:12 the minimum distance above a scissor truss is 18" (458 mm).

Maximum distance from center line of the ridge:
6" (152 mm) on either side of the center line.

Minimum distance from Truss:
6" (152 mm) from nearest edge of the truss.

Draft Curtains:
Where used to allow Attic Upright Sprinkler installation shall be constructed to contain heat, may be constructed of minimum ½" (13 mm) plywood or equivalent.
Continues on next page.

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Continued from previous page.

Use of UL Listed CPVC Blazemaster Piping (Wet Systems Only):
Can be used to supply the sprinklers protecting the floor below the combustible concealed space when covered with 6" (152 mm) of non-combustible insulation over the horizontal or vertical piping, and extending 12" (304 mm) on both sides of the center line of the piping. If the piping is located in the joist, the width of the joist channel must be entirely covered to 6" (152 mm) above the top of the piping. The area above the piping must be protected with the Model V-BB's, V-SD's, or the Attic Upright Sprinklers.

Listed CPVC Blazemaster piping may also be used exposed to feed wet systems using Viking V-BB sprinklers in accordance with the following requirements, and in accordance with Figure 15:

- Risers are vertical and protected by V-BB or V-SD sprinklers located a maximum of 12 (304 mm)" away from the riser centerline.
- Model V-BB or V-SD sprinklers are mounted directly to the branchline.
- Model V-BB or V-SD sprinklers are installed on arm-overs a maximum of 6" (152 mm) laterally from the center line of the branch line.
- Model V-BB or V-SD sprinklers are installed on Vertical Sprigs attached to the branchline.
- Model V-BB or V-SD sprinklers are installed on angled sprigs a maximum of 6" (152 mm) laterally from the centerline of the branchline.
- Installed with a minimum lateral distance of 18" (456 mm) from any device that produces and releases heat, i.e. attic furnace, kitchen or bathroom exhaust fan, flue vents, heat lamps, and other such devices.

NOTICE Insulation requirements are provided solely for Fire Protection purposes and not for freeze protection.

NOTICE Non-combustible insulation being used needs to be verified for chemical compatibility with the CPVC piping at www.lubrizol.com

Obstruction Criteria:
Refer to Figures 4—14
Refer to Sections 8.8.5.2.1.3 and 8.8.5.2.1.7 of NFPA 13, 2013 for requirements if installed on greater than 2-1/2" (64 mm) diameter piping.

Hydraulic Requirements:
Viking V-BB Sprinklers must be calculated in accordance with the following figures and guidelines.
The design area shall include the most hydraulically demanding sprinklers, and in certain cases may require more than one set of calculations to verify the system's design.
The following figures cover Hydraulic Requirements for Viking V-BB Sprinklers only, and when installed with Attic Upright or Standard Spray Sprinklers.
For areas using Viking V-SD Sprinklers refer to the applicable data sheets.

Refer to Figures-unless otherwise noted, all Figures portray a 60' (18,3 m) roof span:
Figure 16 – V-BB Sprinklers
Figure 17 – V-BB Sprinklers & Attic Upright or Standard Spray Sprinklers Beyond an Obstruction
Figure 18 – V-BB Sprinklers & Attic Upright or Standard Spray Sprinklers at the Hip
Figure 19 – V-BB Sprinklers & Attic Upright or Standard Spray Sprinklers in a Dormer, at a Hip, or at an Ell.
Figure 20 – V-BB Sprinklers & Attic Upright or Standard Spray Sprinklers separated by compartmentalization.

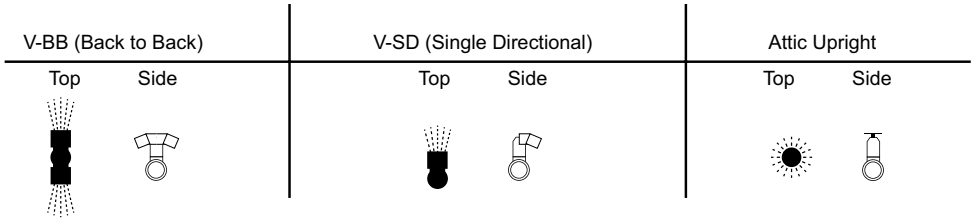

Figure 3: Sprinkler Type Legend

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Refer to figures 4 and 5 below-unless otherwise noted, all Figures portray a 60' (18,3 m) roof span. Maximum 6" (152 mm) obstruction allowed provided it sits at least 36" (914 mm) vertically below the Viking V-BB Sprinkler. Larger or closer obstructions require an additional sprinkler on the opposite side of the obstruction. This criteria only limits the obstructions that run across the trusses or rafters, not the top chord of the trusses or the depth of the rafter.

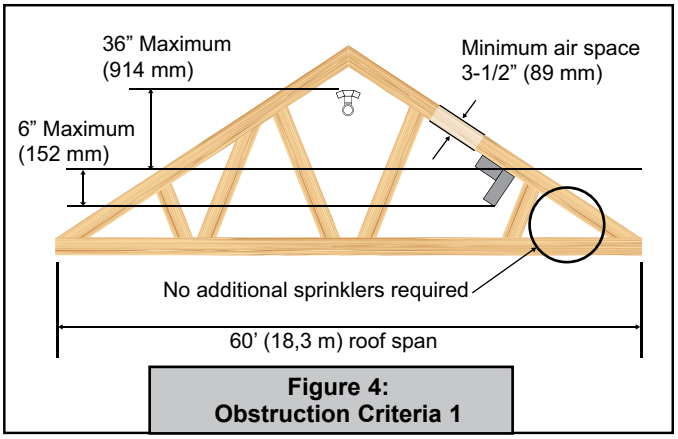

Figure 4:
Obstruction Criteria 1

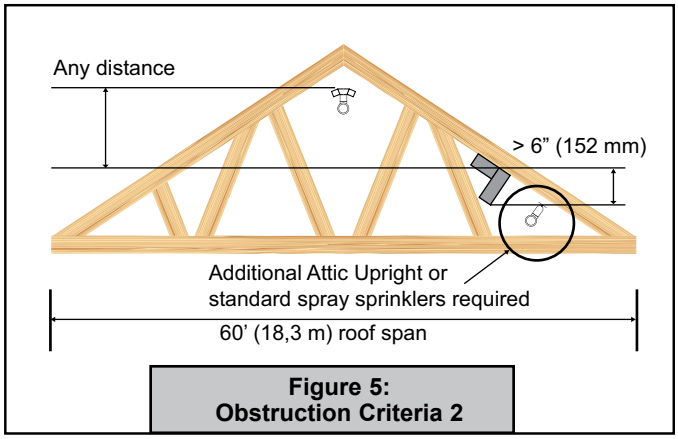

Figure 5:
Obstruction Criteria 2

Refer to Figures 6 and 7 below where the maximum spacing for Attic Upright Sprinklers is 12 ft. (3,7 m) and standard spray sprinklers is 15 ft (4,6 m). Any horizontal obstruction that is 4 ft. (1,2 m) or less in width requires minimum 6" (152 mm) clearance over the top to allow for sufficient water flow over and under. The clearance must be measured perpendicular to and from the bottom of the rafter. If the clearance is less than 6" (152 mm), an additional sprinkler is required on the opposite side of the obstruction. If the obstruction is more than 4 ft. (1,2 m) wide, an additional sprinkler is required underneath.

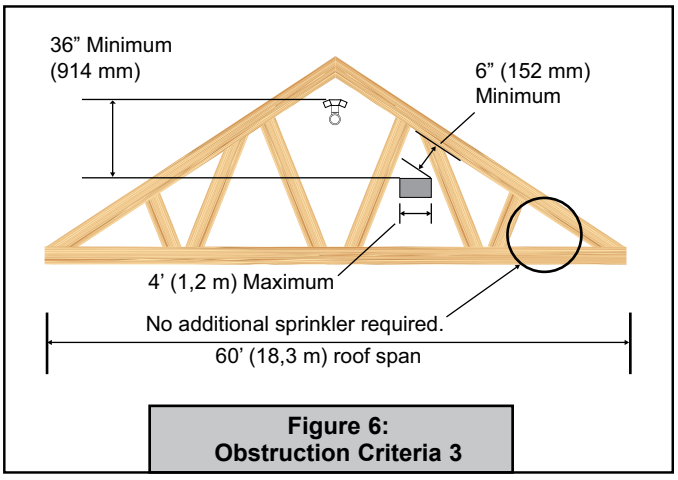

Figure 6:
Obstruction Criteria 3

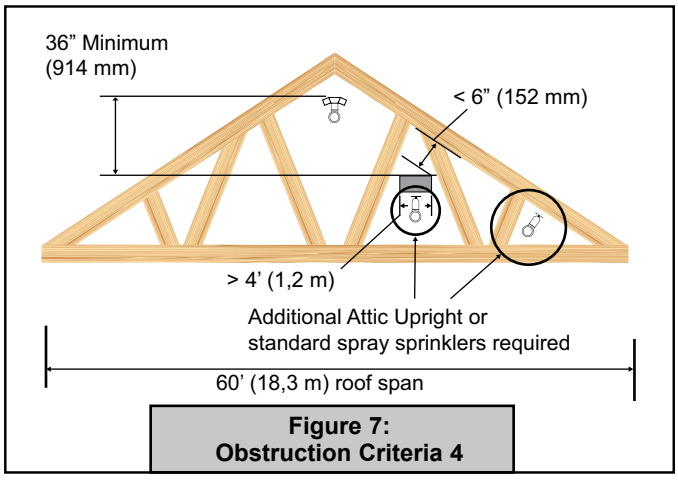

Figure 7:
Obstruction Criteria 4

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Refer to Figure 8 below. For vertical obstructions, the maximum dimension of the obstruction is the width and the horizontal distance is measured horizontally.

TABLE 2: OBSTRUCTION CRITERIA

Dimension X	Distance Y	Additional Sprinklers Required Beyond Obstruction
Maximum Horizontal Dimension of Obstruction	Minimum Horizontal Distance to Obstruction	
All vertical obstructions	< 6” (152 mm)	YES
1/2” - 1” (13 mm - 25 mm)	6” (152 mm)	NO
1” - 4” (25 mm - 102 mm)	12” (305 mm)	NO
4” - 8” (101 mm - 203 mm)	24” (610 mm)	NO
8” - 10 “ (203,mm - 254 mm)	5’-0” (1,5 m)	NO
10” - 20” (254 mm - 508 mm)	10’-0” (3,0 m)	NO
20” - 30” (508 mm - 762mm)	15’-0” (4,6 m)	NO
30” - 40 “ (762 mm - 1016 mm)	20’-0” (6,1 m)	NO
40” - 48” (1016 mm - 1219 mm)	25’-0” (7,6 m)	NO
> 48” (1219 mm)	Any distance	YES

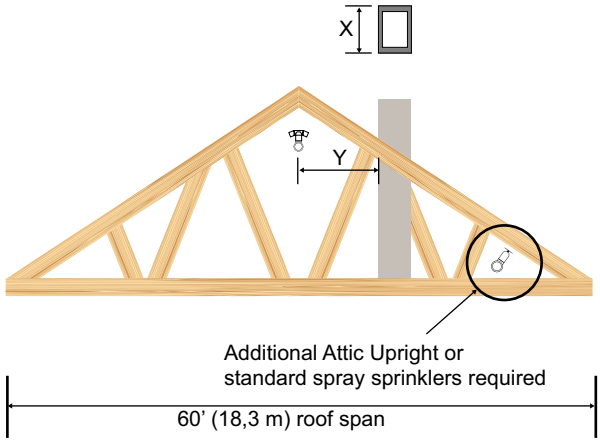

Figure 8:
Obstruction Criteria 5

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If a V-BB Sprinkler is 36” (914 mm) or greater avove the space, and 36” (914 mm) or greater clearance above the space is present, additional sprinklers are not needed.

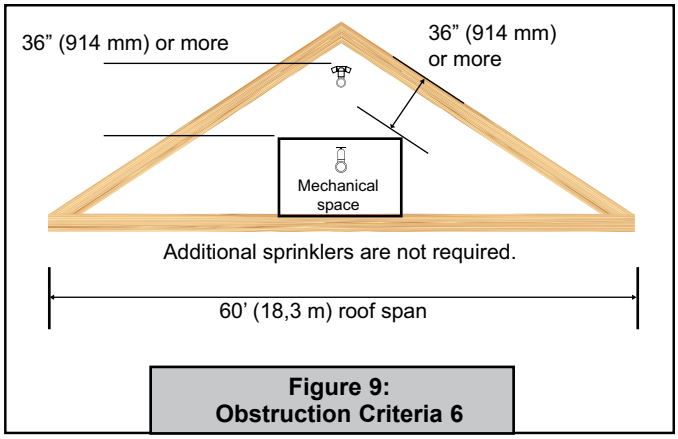

Figure 9:
Obstruction Criteria 6

If a V-BB sprinkler is 36” (914 mm) or greater above the space, and a 12” - 36” (304 - 914 mm) clearance above the space is present, intermediate level standard sprinklers are required.

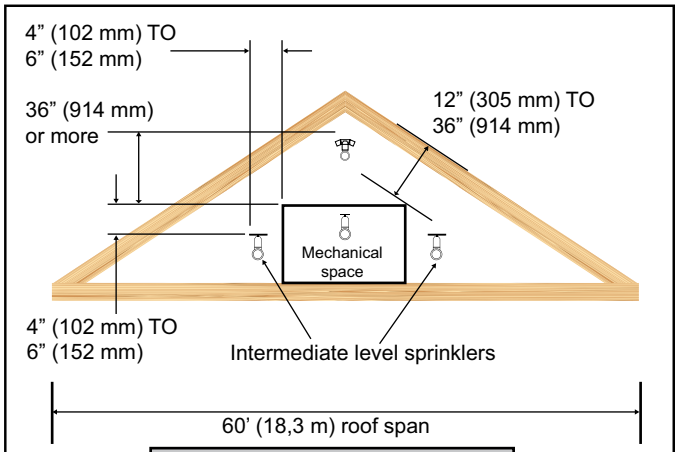

Figure 10:
Obstruction Criteria 7

Otherwise, the area outside the mechanical space is to be protected as shown using standard spray sprinklers as necessary or by building a shear wall and installing V-SD Sprinklers.

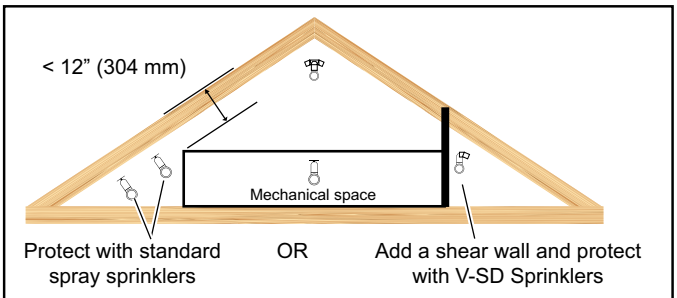

Figure 11:
Obstruction Criteria 8

TECHNICAL DATA

MODEL V-BB SPECIFIC APPLICATION ATTIC SPRINKLER

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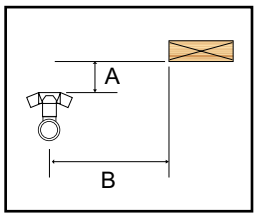
If a V-BB Sprinkler can be installed below or between stiffeners and 16 to 22” (404 to 559 mm) distance to peak can be maintained, as well as A and B clearances to the stiffeners, no additional sprinklers are required.

A	B		
	VK681 VK684	VK682 VK685	VK683 VK686
0”	0”	0”	0”
A >0”	A +15”	A +10”	A +8”



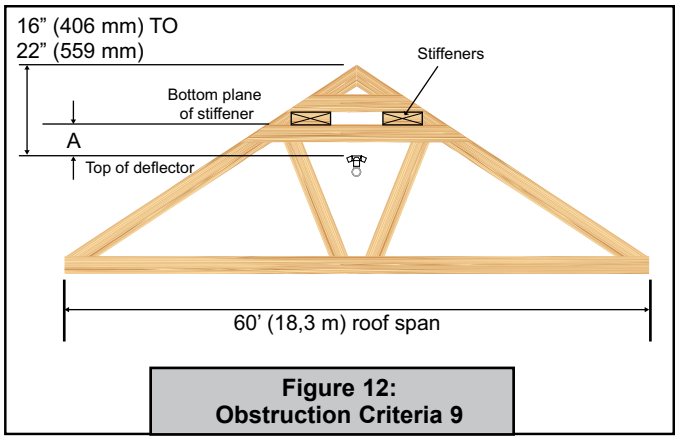


Figure 12:
Obstruction Criteria 9

When the stiffeners are located a minimum of 12” (305 mm) below the V-BB Sprinkler, the stiffeners are 7-12” (190 mm) maximum wide, the openings are 12” (305 mm) minimum, and there is 70% minimum open area, no additional sprinklers are required.

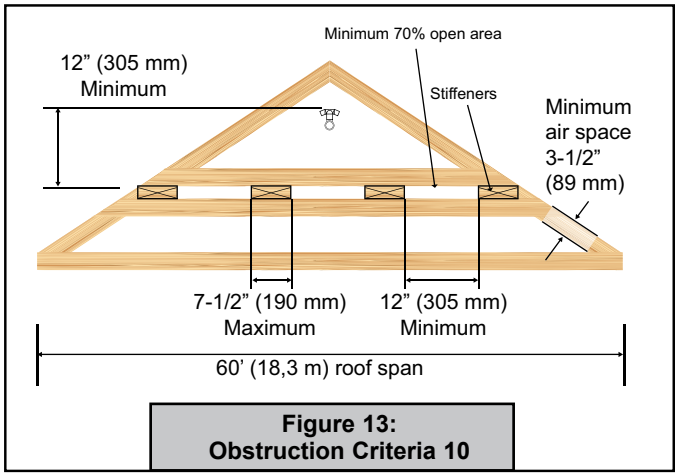


Figure 13:
Obstruction Criteria 10

Otherwise, additional sprinklers are required as shown.

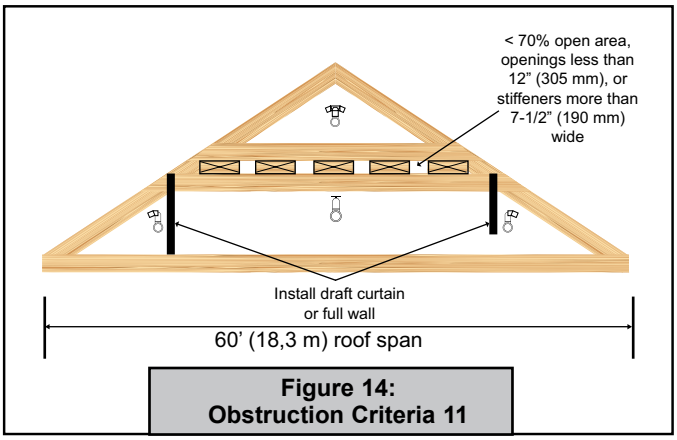


Figure 14:
Obstruction Criteria 11

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X = 6” (150 mm) MAXIMUM
Y= 12” (300 mm) MAXIMUM

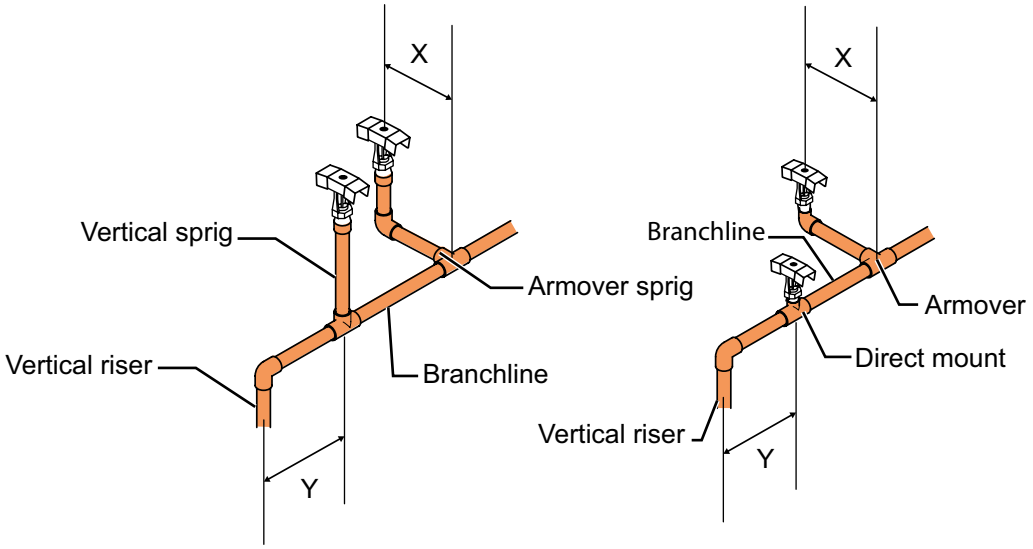
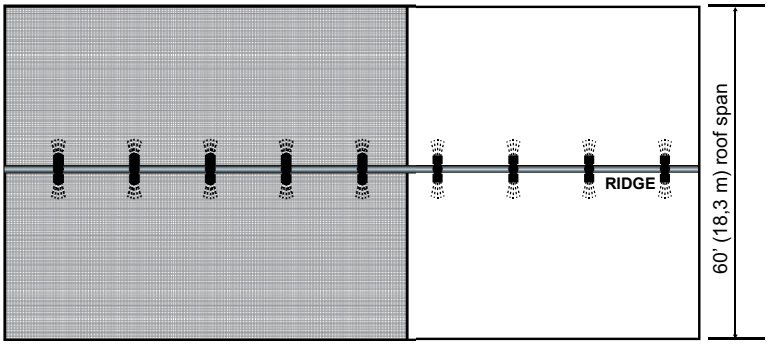


Figure 15:
Exposed CPVC with V-BB Sprinklers

Wet Systems: Calculate the most demanding 5 sprinklers.

Dry Systems: Calculate the most demanding 7 sprinklers.



NOTE: Wet system shown.

Figure 16:
V-BB Sprinklers

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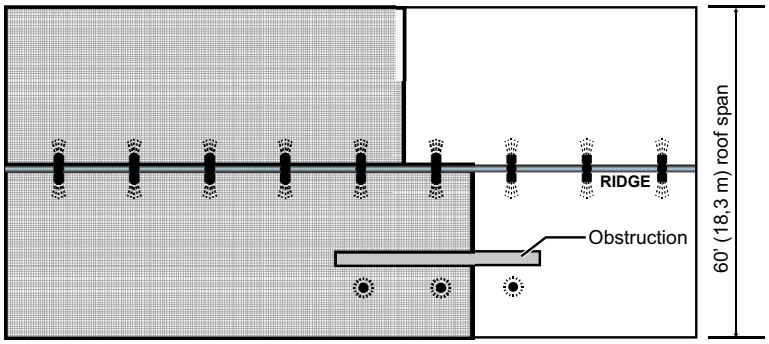
Wet Sytems: Calculate the most demanding 5 V-BB sprinklers and add up to 2 of the most demanding Attic Upright or Standard Spray Sprinklers.

Dry Sytems: Calculate the most demanding 7 V-BB sprinklers and add up to 2 of the most demanding Attic Upright or Standard Spray Sprinklers.



NOTE: Wet system shown.

Figure 17:
V-BB and Attic Upright or Standard Spray Sprinklers Beyond an Obstruction

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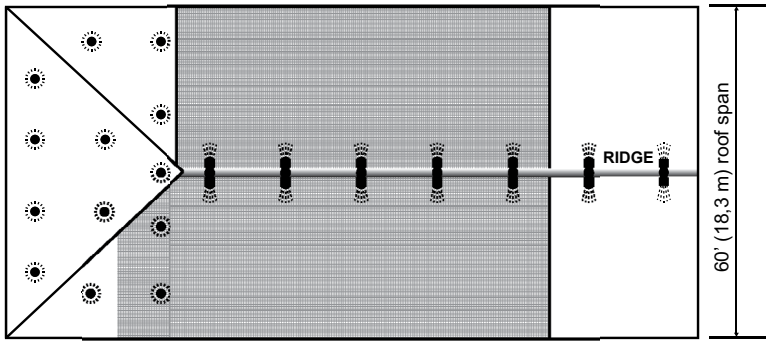
Wet Sytems: Calculate the most demanding 5 V-BB sprinklers plus the 2 most demanding Attic Upright Sprinklers, and then calculate the most demanding area up to 1500 ft² (137m²) having Attic Upright sprinklers. Use the most demanding calculation.

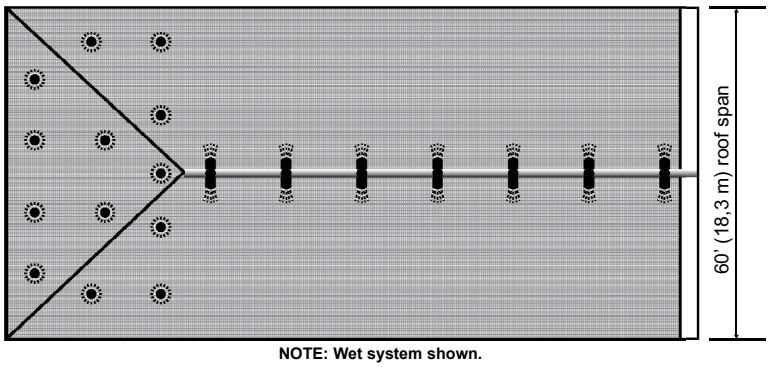
Wet Sytems: Calculate the most demanding 5 V-BB Sprinklers and add up to 2 of the most demanding Standard Spray Sprinklers, then calculate the most demanding remote design area (including ALL sprinkler types) per NFPA 13. For example, area reduction for quick response and 30% increase for sloped ceilings. Use the most demanding calculation.



NOTE: Wet system shown.

Dry Sytems: Calculate the most demanding 7 V-BB sprinklers plus the 2 most demanding Attic Upright sprinklers, and then calculate the most demanding area up to 1950 ft² (181 m²) having Attic Upright sprinklers. Use the most demanding calculation.

Dry Sytems: Calculate the most demanding 7 V-BB Sprinklers and add up to 2 of the most demanding Standard Spray Sprinklers, then calculate the most demanding remote design area (including ALL sprinkler types) per NFPA 13. For example, 30% increase for sloped ceilings and 30% increase for dry systems. Use the most demanding calculation.



NOTE: Wet system shown.

Figure 18:
V-BB and Attic Upright or Standard Spray Sprinklers at the Hip

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Where the quantity of Attic Upright or Standard Spray sprinklers in each dormer, cross, or ell is 4 or less and all of the dormers, crosses and ells meet the maximum 4 standard sprinkler criteria, calculate the V-BB demand as shown in Figures 16 and 17, and add up to 2 of the most demanding Attic Upright or Standard Spray sprinklers in the dormer, cross, or ell that is adjacent to the Attic Upright Sprinklers that are bing included in teh demand calculation.

Where the quantity of Attic Upright or Standard Spray sprinklers in any dormer, cross, or ell is greater than four, refer to Figure 18.

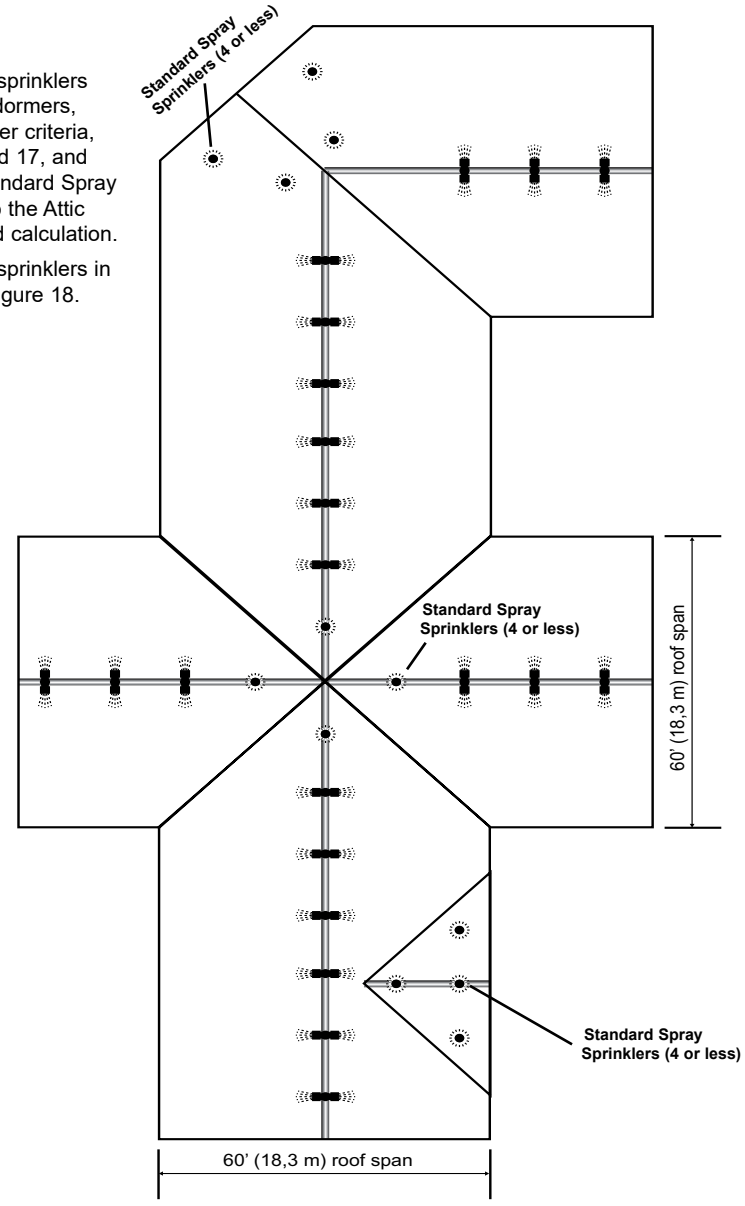

Figure 19:
V-BB Sprinklers and Attic Upright or Standard Spray Sprinklers in a Dormer, at a Hip or at an Ell

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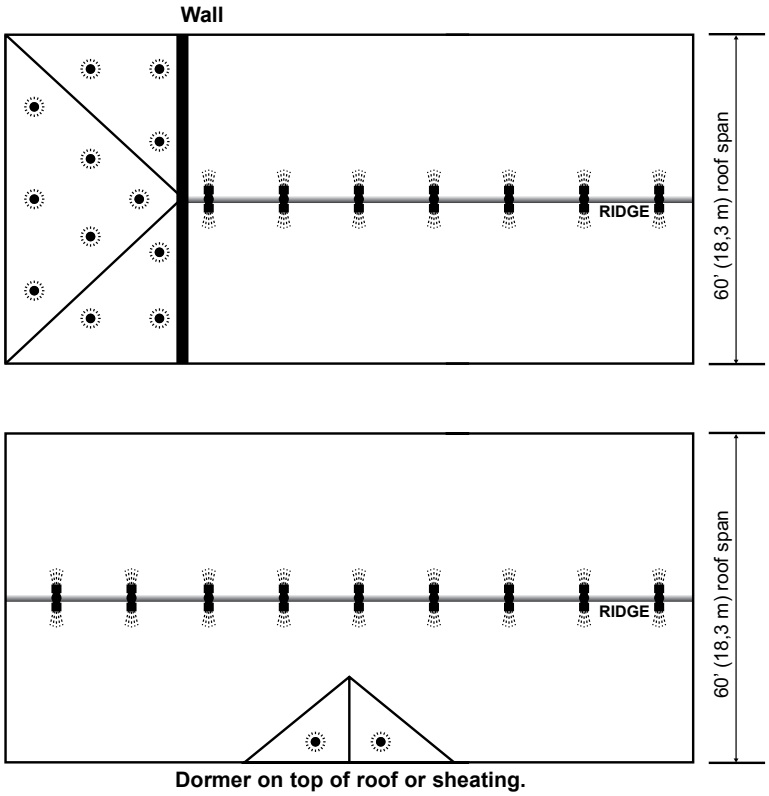
Calculate the V-BB demand as described in Figures 16 and 17, then calculate the Attic Upright or Standard Spray Sprinklers per NFPA 13. use the most demanding calculation.



Dormer on top of roof or sheating.

Figure 20:
V-BB Sprinklers and Attic Upright or Standard Spray Sprinklers Separated by Compartmentalization